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NEWSPAPER

Alternate Software Sources Prove Boon

By Brad Schultz
CW Staff

With increasing frequency over the past several years, mainframe users have been discovering they need not feel locked into using an operating system developed by the maker of their hardware.

For example, the Dartmouth Time-Sharing System (DTSS) offered by DTSS, Inc. has proved a big success with Computer Time-Sharing Service (CTSS) of New York and with the Hughes Aircraft Corp. — a large- and a small-volume user, respectively, of Honeywell Information Systems, Inc. mainframes.

Originally developed at Dartmouth College by the inventors of Basic, DTSS was written specifically for time-sharing and presently offers general-purpose computing to more than 500 simultaneous users, according to the New Hampshire vendor.

CW **Special Report on Systems and Utility Software follows Page 42.**

The system software supports HIS Series 6000 and Series 60 Level 66 CPUs and also employs an HIS 716 minicomputer as a communications processor.

The CTSS installation features dual HP 66/17 processors, each with 384,000 words of core, according to CTSS president Jerrol Alkema. The facility also uses two front-end 716 minis for communications processing and has a standard high-speed printer, card reader/punch and a magnetic tape unit.

CTSS generally has about 120 simultaneous DTSS users, Alkema said, and a total user (customer) population of several thousand. On a typical day, this facility executes 15,000 to 20,000 jobs, he estimated, not counting nonrevenue tasks such as system maintenance.

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COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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A Nested Procedure

The brains at the University of Michigan are not all inside its Data Systems Center, as this photo sent to *Computerworld* by Dave Kowal shows. Using first-generation architecture, a robin hatched the idea of using the discarded edges of printout paper to pad its nest.

SBS Says It Supports Communications Bill

By Ronald A. Frank
CW Staff

WASHINGTON, D.C. — Satellite Business Systems (SBS) supports the Communications Act of 1978, especially if it means that monopoly carriers such as AT&T "will not have the same ability they do today to dominate the interstate telecommunications market through anticompetitive practices," SBS President Philip N. Whittaker told a congressional subcommittee last week.

Speaking at hearings held by the House Subcommittee on Communications on House Bill 13015 — the rewrite of the Communications Act of 1934 — Whittaker said the proposed Communications Regulatory Commission (CRC) should have broad powers during an interim startup period "to suspend, summarily reject and prescribe new intercity rates to the extent they are cross-subsidized" by existing carriers.

In this way, replacement for the Federal Communications Commission (FCC) will be able to deal effectively with the ability "and historic practice" of a telecommunications carrier such as AT&T "to misallocate costs and revenue requirements among its services."

SBS supports the twin policies of competition and deregulation proposed in the bill as being in the best interests of the industry and the public, the SBS chief told Rep. Lionel Van Deerlin (D.-Calif.), the principal author of the act and chairman of the subcommittee.

But not all witnesses testifying on the first day of hearings favored the legislation. Theodore F. Brophy, chairman and chief executive officer of General Telephone & Electronics Corp., said the bill contains significant and perva-

(Continued on Page 8)

French Pondering Offer to LDCs

By Rex Malik
Special to CW

ROME — France is currently working on a plan to counter the expected U.S. offer of a global telecommunications network and free terminal facilities to allow less developed countries (LDC) access to U.S. data bases, according to sources here.

The sources, within the Intergovernmental Bureau for Informatics (IBI), indicated the French counterproposal may be made at the Intergovernmental Conference on Strategies and Policies in Informatics (Spin), particularly if the U.S. proposal [CW, June 26] surfaces there. That conference will be held in Torremolinos, Spain, Aug. 28-Sept. 6.

IBI is an international organization now numbering 26 member nations. It was established to develop international information policy and assist member countries in setting information policy within their own boundaries.

No firm details of the French counterproposal are available, the IBI sources said, since the subject is still under intense discussion by the French Ministry of Industry in Paris.

While French official circles were initially split on the commitment behind the U.S. offer — with some feeling it was just a "bluff" — the French now

(Continued on Page 6)

IN DEPTH
IN DEPTH
IN DEPTH

New telecommunications offerings — electronic message systems (EMS) among them — are taking too long to reach the user. Philip S. Nyborg offers a solution to this bottleneck in "EMS: Why the Delay?" beginning on Page 14.

Utility Working to Control Residential Water Heaters

By Marguerite Zientara
CW Staff

MILWAUKEE — The Wisconsin Electric Power Co. hopes to have a system within three years that will automatically shut off the water heaters of 154,000 residential customers during the hours when use of electricity peaks.

If everything goes as planned, remote-controlled air conditioning may be the utility's next project.

The system will be the country's first large-scale, two-way communications path between an electric utility and its customers that controls the use of electricity, according to American Science and Engineering, Inc. (AS&E), the Cambridge, Mass., research and development firm awarded the contract for the job, which it estimated will total $20 million when completed.

A test program has been operating for the past two years involving 450 residential customers served by two power distribution substations in Wisconsin. "The water heater experiment has been sufficiently successful that about a year ago Wisconsin Electric be-

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Associate Editor	Donald Leavitt
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Please address all correspondence to the appropriate department at 797 Washington Street, Newton Mass 02160 Phone (617) 965-5800 Telex USA 92 2529

OTHER EDITORIAL OFFICES: Washington, D.C.: 821 National Press Building, 529 14th Street N W Washington D C 20045 Phone (202) 347-6718 **England:** Roger Frampton, Computerworld Publishing Ltd 2 Bath Road London W41LN Phone (01) 995-3352, Telex 934287 **W. Germany:** Hans-Jurgen Ballnath, Computerworld c/o CW Publikationens, Friedrichstrasse 31 8000 Munich 40, Phone (089) 34 90-61 Telex 5215350 **Asia:** Hidetsuna Sasaki Computerworld c/o Dempa/Computerworld Company Dempa Building 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141 Phone (03) 445-6101 Telex J2424461 **Australia:** John P Costello Computerworld Pty Ltd 3 Bruce Street, Crows Nest, NSW 2065 Phone 929 5388 Telex SLCCO AA25468

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Congress Told Not to Make Hasty Policy On What Can Become Citizen Data Bank

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — Congress must know more about the quality of criminal history records shared among federal and state law enforcement agencies and the harm caused to individuals by their use before it can fashion policies to govern what some have contended could become a national data bank on citizens.

This concern headed the list of issues drawn up by the congressional Office of Technology Assessment (OTA) here in its just released preliminary assessment of the Federal Bureau of Investigation's National Crime Information Center (NCIC).

Other issues on the list included the following:

- Will the FBI contribute to the growth of federal social control or become an instrument for subversion of the democratic process?
- Is there a conflict between maintaining national privacy and civil liberties trends and decentralizing responsibility for the NCIC's Computerized Criminal History (CCH) system?
- How will the CCH system cause or contribute to changes in the operation and organization of criminal justice?

All of these questions must be addressed and addressed soon, OTA said.

Message-Switch Controversy

Requested by the judiciary committees of both ~~the~~ House and Senate, the assessment of NCIC and particularly of its CCH file will become a part of a broader OTA study on the societal impacts of national computer systems, a source close to OTA said.

The NCIC — begun by the FBI in 1967 to provide criminal justice agencies throughout the country with access to information on crimes and criminals — has become the focus of a controversy centered on whether the FBI should be permitted to operate a message-switching service to route inquiries and responses about criminal history files among the states. This question rests on broader issues, however, including the system's potential impact on citizens' constitutional rights and on the relationships between the federal and state governments in the administration of criminal justice, a draft of the preliminary report said.

"Criminal justice practitioners are virtually unanimous in their view that interstate exchange of criminal history information is necessary for the efficient and effective administration of justice," OTA stated. For example, the draft report noted that as many as 30% of the individuals with criminal history records in the U.S. show arrests in more than one state, and as many as 17,000 criminal justice agencies have a need for immediate access to criminal histories.

At the same time, the value of out-of-state criminal history information to a law enforcement effort might be lost if a transmitted record is not complete, accurate and current, OTA found.

While bringing the activities of "career criminals" to an end is certainly in the public interest, many have contended that of equal public concern is the protection of individual privacy and the right to due process under the law, OTA stated.

But policymakers have little "hard evidence" about the origins, frequency and consequences of erroneous or incomplete CCH records in the NCIC system, the preliminary assessment said.

CCH information is also used for the evaluation of applicants for employment or licenses by the federal government and some states. The harm that can be done to an individual's chances for employment by incomplete, inaccurate or improperly disclosed records is recognized, "but information on the extent of the problem is not available," OTA stated.

Role of States

Because the U.S. criminal justice system is decentralized and most of the criminal history information available is generated by state and local law enforcement agencies, OTA believes its further assessment of NCIC should examine the role the states should have in creating standards and procedures for CCH information. Balanced against this need is the requirement for minimum national standards if an interstate CCH system is ultimately approved, the draft assessment added.

The states and local criminal justice agencies will also have to incur the lion's share of the anticipated expense and operating cost of a national criminal justice system, OTA noted. How a system that is estimated to cost several hundred millions of dollars over the next 10 years is to be funded must be addressed now.

Such a study should include an understanding of which states will benefit most from the system and when local efforts to use the network should be subsidized with federal and state funds, the draft study recommended.

"Both the FBI and state criminal history repositories have tended to view themselves as conduits for records provided to them by others," OTA said. As a result, management responsibility for CCH records in the NCIC system is "weak and ambiguous."

OTA also flagged as issues whether the FBI is the appropriate agency to manage the CCH system and whether the Justice Department's current effort to come up with a "blueprint" for CCH shouldn't include special interest groups and the public at large in the planning process.

"The message-switching concept has raised a furor, in part because of concern that the resulting CCH system would be equivalent to a national data bank, even though the files are physically decentralized and [because of concern] that control of the message switch would give the FBI excessive control over the user agencies," OTA said.

From a technical viewpoint, alternative approaches to managing message traffic are available to the FBI and should be explored, the draft assessment stated.

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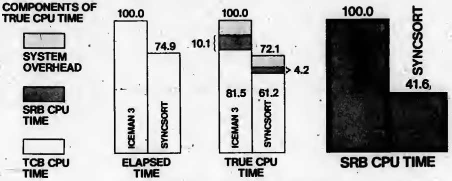
Here's a recent example: A certain large MVS user — in pursuit of the very best OS sort available — sponsored a "showdown" benchmark between SyncSort and IBM's 5740-SM1, Release 3. Let the best sort win!

Apparently IBM took the test seriously, because they flew in one of their top "sorting aces" to critique the results. A hardware monitor would be used to pick the winner. It was said to be of "awesome accuracy."

As the two sorts took off and the benchmark began, this eagle-eyed device began to shoot some gaping holes in ICEMAN 3's performance — or lack of it.

ICEMAN not only used a lot more computer resources than SyncSort — it also suffered from a near terminal case of "locked up" SRB Time. This is, of course, that portion of True CPU Time when no messages get through to the CPU. Very dangerous to non-sorting jobs in the mix! Like going down through an overcast with no radio or instruments.

The final results of our duel in the sun looked like this:



How did IBM's ace react to being shot down? Like a gentleman and a scientist. With a stiff upper lip, he admitted: (1) that SyncSort was a good deal better than ICEMAN; and (2) that there wasn't much he could do about *that*.

Then he packed his bags and flew off westward into the sunset.

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U.S. vs. IBM Takes Recess With 91 Witnesses to Hear

By Catherine Arnst
CW Staff

NEW YORK — The participants in the U.S. vs. IBM antitrust trial decided the living should be a little easier in the summertime and recessed last week until Sept. 11.

The recess was declared Wednesday morning after Richard Case, IBM's director of advanced systems development for the DP Division, left the stand after 28 days of testimony.

Since April 26 — the day IBM started its defense presentation in the three-year-old trial — four witnesses have taken the stand. In addition to Case, they included James Welch, vice-president of the Information Services Group at Chemical Bank, James O'Neill, vice-president of management information for American Airlines, and Douglas McGrew, director of computing and telecommunications services at Union Carbide Corp.

These three were on IBM's list of 12 customer witnesses, and each spent approximately 10 days on the stand. Lead IBM attorney Thomas Barr said in court he may drop some of the remaining customer witnesses, although no definite plans have yet been made.

IBM now has 91 witnesses left on its witness list, and Barr said he has "no idea" how long it would take to complete his side of the case. It took the government almost three years to present 50 witnesses.

Barr did suggest one could make an estimate based on the average length of testimony of the witnesses heard from already. If Ernest Hughes, who testified for two days in December 1976, is counted, that average would be 12 days per witness.

The court sits approximately 200 days per year, so it could conceivably take five years for IBM to present its case if it stays with its present witness list.

Bomb Hits IBM Center

TURIN, Italy — A terrorist group bombed an IBM data and technical assistance center here last week, causing minor damage to the outside of the building.

The home-made bomb, which exploded against the doorway of the data center in the early morning hours of Monday, July 24, shattered windows but caused no injuries to people or equipment.

One of the members of the group, which called itself a revolutionary group, placed a call to Ansa, the Italian news agency, later that day and claimed responsibility for the blast. The caller said the attack was made against the "multinational IBM for political reasons."

The same IBM building sustained bombing attack nearly three months ago, on April 26. At that time, more extensive damage occurred and some of the computer equipment in the building was damaged. Both bombings are under investigation.

Utility to Control Heaters Remotely

(Continued from Page 1)

gan planning how to proceed into the future," Ralph Abbott, AS&E's vice-president of utility systems marketing, said.

The system's major goal is to reduce the construction of new plants. This should result in customer savings of about $40 million over a 28-year period, according to Wisconsin Electric President Charles S. McNeer.

Two-Stage Implementation

The system will be implemented in two phases, Abbott said. The first phase, which has been approved by Wisconsin's Public Service Commission, will be a load management system that automatically reads the meters of 1,600 commercial power users.

That phase does not involve shutting off any power, but only monitoring electricity consumption for the purpose of billing on a time-of-day rate structure. Under such a rate structure, power costs more at peak use times.

Shown above is the transponder installation through which Wisconsin Electric can turn on and off residential water heaters.

The second phase will entail shutting off 154,000 residential electric water heaters during those peak use times. The commission has not yet approved this plan, although it authorized purchase of the necessary equipment in late June.

For the meter reading and water heater control programs, transponders will be mounted on residential electric meters. The transponders can turn off the hot water heaters, read the electric meters and determine how much power is consumed during specific periods for calculating time-of-day use rates.

"If a utility shuts off a water heater for 30 minutes out of every hour, the customer still has all the hot water he needs and is never aware it is being done," Abbott said.

"On a very hot day, a utility will be 'flat out' trying to generate enough power. Hot days are very expensive because the company is cranking up its old junky units, combustion turbines and diesel peaking plants that don't run on coal or nuclear power, but on expensive refined oil," he continued. "It is very much in the utility's interest to reduce the peak load."

Air conditioning can be "cycled," Abbott said, which can remove "quite a bit of the load with a barely perceptible difference in customer comfort." When an air conditioner is cycling, it can still keep the humidity down, even if it is shut off for seven minutes out of every half hour, Abbott said.

The utility gives customers under the system a bill reduction of "a couple of dollars per month," Abbott said. "There is truly something in it for everyone. It's not a case of Big Brother, 1984, with the arbitrary shutting off of certain appliances."

A survey has indicated about 150,000 of the utility's 200,000 customers would be willing to allow installation of the devices in return for an $18/year rebate.

The utility's System Control Center, located in Pewaukee, Wis., is loaded with computer equipment. There are four Control Data Corp. Model 1774 CPUs, each with 32K bytes of 16-bit words, and two CDC Cyber 73-16 large-scale CPUs, each with 64K of 60-bit words, according to Tom Varney, project leader for the proposed system's software.

In addition, there are four Data General Corp. Nova 210 minicomputers, one with 24K of 16-bit words and three with 16K of 16-bit words, Varney said. The center also has eight remote 8K-byte Nova 210s.

The Pewaukee equipment communicates with equipment in a smaller control center in Appleton, Wis. That center has two 32K-byte CDC 1774s and two 24K-byte Nova 210s.

The Appleton equipment drives yet another remote center at Iron Mountain, Mich., that has two Nova 210s, Varney said.

CRTs Provide Interface

The System Control Center now has 20 CDC CS-19 CRTs used as "man-machine interfaces for controlling and monitoring our transmission and generation system," Varney said. The CRTs are currently used to determine such things as the status of line breakers — whether they're open or closed — how much power is flowing over each line and the status of generator units, he said.

If an operator desires to open or close a breaker, he can do it from the console, Varney noted.

Under the proposed system, these 20 CRTs will be able to "drop all the water heaters they want to or institute a schedule of dropping water heaters," Varney said.

Four DG Eclipse S230 minicomputers with 256K bytes of core memory will run the entire two-phase program, according to Abbott. Two of the Eclipses will be located in the same room as the CDC equipment at the System Control Center in Pewaukee, and two will be located in Appleton.

The Eclipses will work independently of the CDC equipment and there will be a communications link between the two locations. They will be indirectly linked to the CDC equipment, Varney said, explaining that multiprocessor communications adapters will join one Nova 210 to the Eclipse equipment "so it will be possible for the CDC equipment to talk to the Eclipse equipment."

The DG central computers will communicate with the distribution substations over telephone lines.

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Colleges Say Mini-Based Net a Bust

Boeing Sued for 'Professional Negligence'

By Edith Holmes
CW Staff

CHICAGO — The City Colleges here recently filed a $2.5 million lawsuit in federal court against Boeing Computer Services Co. for "professional negligence" in its failure to provide the schools with a student administration system.

The suit charges Boeing with failing "to exercise due care and diligence in the performance of its professional services." Because the firm "so negligently, carelessly and unskillfully" developed and implemented the Student Program Administration System (Spas), the colleges contended, Boeing did not design a computer configuration that could meet the system's functional requirements.

Filed in the U.S. District Court for the Northern District of Illinois, Eastern Division, the colleges' claim also maintained that the Varian V76 minicomputer procured by Boeing on an OEM basis could not support 62 terminals on-line with a three-second response time. Boeing, and not Varian as the CPU manufacturer, is being held liable for the inability of the equipment to meet the system design specifications.

Boeing would not comment on the charges because "the matter is in the courts," according to Bill Sparks, district sales manager for the firm's Central District.

Ready to Fight

The City Colleges of Chicago lodged their complaint against the service firm in answer to a suit brought by Boeing. Boeing had sued the universities for the money it spent developing the system after the schools terminated their contract with the company. The contract was terminated after the project had slipped a year, according to the schools' complaint.

One of the first negligence cases in this industry to arrive in the federal court system, the suit emphasizes Boeing's role as "a firm of computer analysts, programmers and specialists holding itself out to the public as possessing the professional skill, competence and care required for the performance of the professional duties and responsibilities of computer analysts, programmers and specialists."

Licensed or not, certified or not, programmers and systems analysts are "professionals" subject to charges of negligence, the colleges indicated. The schools' chancellor, Oscar Shabat, plans to take the case all the way through the federal court system if he has to in order to prove this point, a spokesman said.

The City Colleges of Chicago began discussing their desire to upgrade their batch student accounting system with Boeing in December 1975. The company won three successive contracts to develop the application software, procure the computer hardware and acquire the necessary terminals to support an on-line, interactive system that would serve 110,000 students at nine campuses.

The system was to be able to register a student for all the classes needed to complete a degree or other educational objective, monitor the student's progress toward that goal and support more precise planning of course offerings and faculty staffing, the colleges' complaint said.

The critical design feature of the system, the schools stated, was a capability for handling student registration on all the campuses within a two-day period. Boeing itself wrote this functional requirement into an invitation to firms to bid on the computer hardware.

The system had to be able to manage "62 concurrent, synchronous, 4,800 bit/sec terminals," Boeing's work statement to the colleges stated. "Effective processing is defined as providing an average response time of three seconds or less for 48 concurrent interactive users performing on-line student registration."

During a pilot test of the registration system at one of the colleges, the Varian mini suffered repeated malfunctions and the terminal response time extended well beyond three seconds. By then, the system had only registered 400 students in a full week.

Boeing failed to complete what became a complicated system after setting five finish dates over a six-month periods, and the City Colleges of Chicago declared the firm in breach of its software, computer and terminal contracts.

In their complaint, the colleges have asked that the $424,355 paid on these contracts be returned. They have also asked for compensation for their employees' time, furnished for the system's design and implementation.

The colleges have further maintained that they are owed incidental expenditures for equipment, site preparation and transmission lines and that they should be reimbursed for the cost of designing and implementing a replacement system. These damages were estimated to exceed $1.5 million..

Finally, the City Colleges of Chicago hope to recover the cost of performance bonds — $582,900 — written by the Aetna Casualty and Surety Co. to cover their computer hardware and terminal contracts with Boeing.

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French May Counter U.S. Net Offer to LDCs

(Continued from Page 1)

believe the U.S. offer is serious and, if it is not officially made at Spin, will surface in the next 12 to 18 months.

The French problem in arriving at a counterstrategy is considerable. Both IBI and official French thinking seems to be that the key to the U.S. plans lies in the agricultural data available from satellite surveillance, and this seems to have been the reaction to discussions of the proposals with some LDC governments.

This would certainly be the data and information which would have the most immediate economic impact and usefulness to LDCs — and it is precisely in this area that France and Europe in general have the least to offer, the sources said.

Initial reports on the U.S. plan have placed the U.S. government in a dilemma, IBI sources said. There is hot debate within the LDCs on whether the U.S. has a right to collect agricultural data by remote sensing satellites; they noted. If the U.S. offers the LDCs access to such data, it could lead to politically damaging — at least in the short term — arguments over this issue.

The issue, according to Firmin A. Bernasconi, IBI's director general, had been discussed by IBI members before the proposals were made public. The discussions centered on the limits of sovereignty, a problem which some LDCs are considering legally answering by extending their boundaries upward to cover all their air space.

Although there have been conferences in the past to discuss this issue, it has never been satisfactorily resolved and is very much alive, Bernasconi said.

U.S. Role in Spin

Bernasconi also indicated the IBI has had discussions with the U.S. State Department about U.S. participation in Spin. He does not expect the U.S. to join the IBI, however, since the State Department had said in March the U.S. was not interested in membership.

He considered, worriedly, that were that position to change, it would unbalance the situation in IBI. However, discussions within IBI have made it clear that any such proposal would bring in the Russians as well as the Chinese, with whom the IBI also has been having talks.

However, in his discussions with the State Department, it was evident the U.S. is interested in cooperating with the IBI, Bernasconi said. This contrasts with the situation which existed until fairly recently.

In the first half of 1976, then-Secretary of State Henry Kissinger signed a memo stating the U.S. should not cooperate with the IBI; IBI inquiries failed to find out the reason for that memo, Bernasconi said. The Carter Administration's position, however, is different, he said, noting Carter is taking a fresh look and has given instructions to cooperate fully with the IBI.

Spin will have many industrial observers, not the least of whom will come from IBM. An IBM vice-president has already offered his cooperation to Sydney Passman of Unesco in Paris, who is secretary general of the conference.

The IBM line on IBI has evidently changed; prior to this meeting, IBM staff members had told Bernasconi they had to be against IBI and, he said, indicated IBM opposed IBI attempts to help countries formulate policies for Informatics.

Two-Level Conference

The Spin conference will operate at two levels: technical and political. Some subjects will involve both, such as transborder data flow, privacy and the need to build up national Industries within the LDCs.

The first two, Bernasconi stated, are primarily of concern to the developed countries, the third is of Immediate concern to some LDCs.

Does the IBI have any influence in the policies the LDCs adopt? It is beginning to, Bernasconi said.

For example, when IBM left Nigeria, Nigeria consulted the IBI on the effects that such a move would have.

Bernasconi does not think IBM's interest in Spin is to protect its markets or influence procurement, at least directly. He said the indications he has received show IBM is much more interested in telecommunications.

The sort of IBM people he expects to see at Spin will be similar to those he expects to see from ITT, he said.

Users Opt for Alternatives

(Continued from Page 1)

DTSS works a 21-hour day, 365 day/year, Alkema noted, adding that the system's reliability has so far exceeded 99%.

Alkema said his firm decided to acquire DTSS for two primary reasons: its similarity to the time-sharing offerings of General Electric Co. and "its ability to handle a large quantity of jobs in an efficient and reliable manner."

The similarity to the system software of the world's largest time-sharing service was an important consideration, since many ex-GE personnel were working at CTSS, he explained, adding "we were familiar with . . . and liked the GE concept."

CTSS declined the offerings of Burroughs Corp., Control Data Corp., Digital Equipment Corp., HIS and IBM because the "volume throughput characteristics of [these systems] plus the overall reliability of the cost of hardware . . . was not in the same category [as] DTSS."

For example, HIS's Gcos "didn't even hold a candle to DTSS," Alkema said.

A major benefit of DTSS is its ease of use, he said, explaining "most of the commands are very simple, straightforward [and] intended for people who are not computer people — although there are some very powerful commands at the other end, if one does want to get sophisticated."

Few Negative Aspects

On the negative side, Alkema has found support, maintenance and documentation for DTSS to be "only fair." CTSS performs much of its own maintenance — to the extent of 25% of the jobs run on the system. In-house maintenance is "not something to be entered into lightly," Alkema noted.

In addition, he said the DTSS documentation could be more extensive and accurate. He indicated its wording is too bound to the Dartmouth College environment, which in many ways differs from the typical commercial situation.

However, this New York service bureau is in general quite pleased with DTSS and plans to enhance the system with new packages as they become available from DTSS, Inc.

Carl Reynolds, Hughes Aircraft's director of computing and DP, had one word to sum up his firm's experience with DTSS: "outstanding."

In terms of volume, Hughes is a much smaller user of the system than CTSS, with 20 to 30 persons simultaneously accessing under normal conditions.

The southern California installation features an HIS 66/06 single-processor machine with 192K words of core and 600M bytes of disk storage. It is connected to "several hundred" terminals — mostly DEC Decwriters.

The Hughes facility is up 24 hours a day, seven days a week, except for two hours of preventive maintenance every Saturday morning, Reynolds said. While the CTSS installation offers Basic, Cobol and Fortran, the Hughes system provides just Basic and Fortran 76, which is allocated about "half and half," another Hughes source said.

In deciding whether to buy DTSS, "the problem was that we were spending several million dollars a year in outside time-sharing services, and we asked ourselves how we could best save that money," Reynolds recalled.

"Well, it turns out that about a million dollars a year of that money was on GE Time-Sharing, which is very closely compatible . . . with Dartmouth," he continued.

"So, we looked at DEC and IBM and DTSS and came to the conclusion that the only service that would attract that outside work at a cost we could afford was DTSS."

DTSS has paid for itself every 18 months since its implementation, Reynolds said.

Despite CTSS' misgivings about support, maintenance and documentation, Hughes has found these factors to be "superb," so the problem may be more prevalent with larger-scale implementations.

In addition to an "advanced, flexible, efficient and secure user monitor, DTSS provides a software subsystem for concurrent batch, 14 programming languages, the three data base modules and interfaces to IBM 360/370 systems and other mainframes," DTSS, Inc. spokesman Michael R. Vitale said.

The system will also support a Telenet Communications Corp. host interface protocol for network communications, he added.

"Frequently used languages which come with debugging aids include Basic, Fortran, Algol, Cobol, PL/I, Pilot and the Gmap assembler."

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'Multinational Interests at Stake'

Spin Meeting Taking on Strong Political Tone

Special to CW

TORREMOLINOS, Spain — "For a conference that was going to be a technical discussion, a lot of multinational interests are now at stake," an American businessman remarked after seeing a detailed program of the Intergovernmental Conference on Strategies and Policies in Informatics (Spin) to be held here from Aug. 27 through Sept.6 [CW, June 26].

The event, expected to involve more than 500 government officials from 100 countries, will be sponsored by the United Nations Educational, Scientific and Cultural Organization and the Intergovernmental Bureau of Informatics (IBI) and will be opened by King Juan Carlos I.

Interest in the conference has been building as a result of several developments.

First, reaction to speculation that the U.S. will announce a major initiative to subsidize less developed countries' (LDC) access to U.S. data banks has sparked a flurry of discussions, especially in France, where there is concern "the U.S. might consider trying to wire up the world to its data bases."

In addition, the reelection of IBI Director-General Firmin A. Bernasconi means IBI will have a more forceful role in the future.

Further, confirmation that many delegations to Spin will be headed by ministers and be larger than originally expected has given the meeting more of a political than technical tone.

Unesco Assistant Director-General Abdul Kaddoura has circulated the provisional agenda for the event. It calls for debate on regulation of multinational suppliers of computers, communication and information resource equipment and services.

Finally, IBI, which now has 26 member countries soon to increase to 28, will probably grow more with a number of sign-ups expected after Spin.

Based in Rome, the IBI gets its financial support from the 26 member states including France, Spain, Italy, Brazil, Iran and Algeria. A larger membership will mean an increased program of activities and clout with governments and international organizations. It's work already has the informal blessing of the Group of 77 States of the United Nations (the nonaligned bloc).

The U.S. delegation may find itself under a spotlight because LDCs want to learn more about the prospective global data network services [CW, June 26] and what strings will be attached. The Europeans and Japanese, meanwhile, want to know whether it is a ploy to corner the market on technical information services and the equipment these networks would need to back them up.

Some Europeans who harbor hopes that Euronet data bases could fill something of a world role feel the U.S. "will be dealing Europe a cruel blow" if the plan materializes.

The French would be disturbed if the U.S. should eventually decide to join IBI as this would counter their predominance in Third World activities.

Agenda Items

Preliminary documents Unesco and IBI have prepared suggest business interests can anticipate caustic debates and harmful resolutions. The conference will have plenary sessions and form two working commissions for more informal discussions. The main agenda items are to elaborate on national informatics strategies and policies, indicate basic informatics prerequisites, review applications and discuss the need for regional and international cooperation.

The annotated agenda calls for the conference "to determine the appropriateness of informatics technology, software and hardware offered by national and foreign manufacturers . . . to develop an appropriate industrial infrastructure for informatics to ensure partial or total technological independence in key sectors of national economies."

The conference will consider legislation "to regulate the business of multinational manufacturers." Several sectoral policies will be encouraged such as industrial production, acquisition and tele-informatics.

Issue for Delegates

Delegates will be asked to discuss "the extent to which the acquisition of informatics technology in some countries is hampered by the asymmetry between the high-powered sales efforts of the multinationals, on the one hand, and the inadequate decision-making machinery, which sometimes lacks the background knowledge and experience in informatics; and the absence of national manufacturing, training or technical support programs by multinationals in those countries."

The ramifications of transborder data flow will be treated in terms of:

- Whether there are significant economic questions involved, such as maintaining high employment in technology-related activities, which justify regulation of data flows.
- Whether the absence of legal binders, such as international agreements regulating transborder data flow, hinders compliance with standards of protection and prompt return of data residing abroad.

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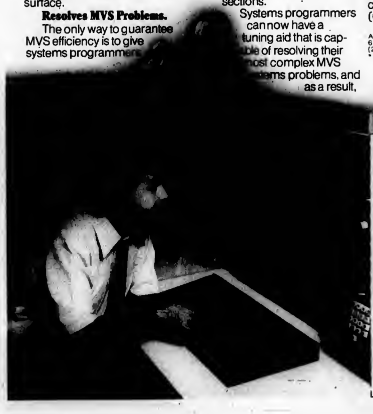

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IBM Backs Deregulation of Common Carriers

By Ronald A. Frank
CW Staff

WASHINGTON, D.C. — IBM "firmly believes" a common carrier should be free to offer on an unregulated basis any service or product, including DP services and products, according to Wallace C. Doud, vice-president of commercial and industry relations.

Testifying before the House Subcommittee on Communications last week, Doud said IBM is impressed by the effort and thought that have been put into H.R. 13015, the rewrite of the 1934 Communications Act now being considered by Congress.

Services that go beyond "pure transmission," including value-added or compound data services, should be excluded from regulation because "a reseller does not perform the actual transmission of information. There is no policy reason why resale should be regulated inasmuch as the underlying common carrier service is subject to regulation," Doud said.

In order to allow a common carrier to offer DP and other nonregulated services, H.R. 13015 should include a provision that "a carrier may not allocate any costs or revenues from noncompetitive services to competitive services," IBM suggested.

Turning to the restrictions placed on AT&T by the Consent Decree it signed with the Justice Department in 1956, Doud said IBM endorses the intent of the proposed legislation that the decree be relaxed.

As long as a carrier's noncompetitive services do not benefit from cross-subsidies from other services, it is unnecessary to require the carrier to set up a separate subsidiary, he suggested.

Speaking for AT&T, Vice-Chairman William M. Ellinghouse said he did not want to disappoint those anticipating a great clash between the telecommunications and DP industries.

"Granted that computers and communications are converging and granted that there may be areas of overlap between the interests of others and our own . . . we in the Bell System feel sufficiently challenged by the tremendous opportunities that lie ahead in telecommunications," he said.

AT&T's intent in offering its recently announced Advanced Communications Service (ACS) "is not to compete in data processing," Ellinghouse said. Instead, the service was designed to allow large and small users to make the fullest possible use of DP technology.

On the aspects of the proposed bill which allow others to compete with AT&T, Ellinghouse said the indiscriminate commingling of specialized carriers with the public switched network will seriously affect the effective design and operation a single integrated network makes possible.

Echoing those sentiments, Richard R. Hough, executive vice-president of AT&T, described in detail the benefits of the Bell network as it now operates. "Authorizing competitors to selectively provide segments of public switched network services will have major adverse effects . . . for all the using public," Hough warned.

In a question period after prepared testimony had been presented, Rep. W. Henson Moore (R-La.) asked the AT&T officials whether there was a technical reason why Bell had favored the primary instrument concept. This would have required that the first phone at customer sites be only a telephone company-provided phone. Ellinghouse responded that the primary instrument concept would assure the maintenance of end-to-end service.

Moore than asked if it were really any business of the government what type of telephone a user wishes to install. None of the witnesses responded.

Staff counsel Harry (Chip) Shooshan asked Hough to describe the operations of limited service suppliers such as the specialized carriers and Satellite Business Systems. Hough said these offer a direct substitution for Bell services.

Shooshan then asked whether ACS was a response to the service offered by Telenet, and Hough said no, stating ACS goes well beyond any service available today.

In response to another question about the desirability of having competitition for network services, Hough said "an uncontrolled competitive mishmash makes it impossible to manage the network."

Looking for a Job? Top Post at Fedsim Open

WASHINGTON, D.C. — The search is on for a new technical director for the Federal Computer Performance Evaluation and Simulation Center (Fedsim).

Philip J. Kiviat, who has held that post for six years, is retiring from government service to join SEI Computer Services here. The government wants to find "the best possible" replacement for the position, which offers a negotiated salary of up to $47,500.

Kiviat has "enjoyed working with the government immensely" and has "learned a lot" in the position, he said, but feels it is time to "move on" to new challenges.

The position is a powerful one within the government DP circles. Fedsim, which is operated by the Air Force for the entire government, consults with many federal agencies and branches on their computer requirements.

The person for the position needs a strong technical background with a great deal of experience in computer performance evaluation, including hardware and software monitoring, modeling, communications analysis and management audits.

Management experience is also necessary, and candidates for the position must have a proven ability to manage projects and people who perform consulting work.

The job involves directing Fedsim's technical program, which is about one-third measurement and DP installation review, one-third detailed simulation models of operating systems and special-purpose real-time software and one-third projects dealing with procurement, such as workload analysis, benchmarks and load balancing.

The government is undertaking the widest possible search for the director, Kiviat said, suggesting interested parties send resumes to Col. David D. Igelman, Fedsim, Washington, D.C. 20330. Igelman can be reached by telephone at (202) 274-8067.

IBM Says Yes to Rewrite

(Continued from Page 1)

sive failings.

The range of CRC discretionary powers "far exceeds" broad discretion exercised by the FCC under the 1934 act, Brophy said.

Further, the FCC has a wide body of court decisions to guide its actions, but the proposed bill uses new words and phrases that could eliminate the legal determinations built up over the years, he warned.

As an example of the broad CRC powers, Brophy pointed out the bill gives the power to decide which common carrier services are competitive and which are noncompetitive, and this determination is left to the CRC without any clear delineation.

The proposed legislation should be approached with great care to make sure that it solves the problems it is intended to solve and adequately protects the public interest, he said.

Confidence in Marketplace

C. Gus Grant, president of Southern Pacific Communications, said he is confident marketplace forces rather than regulation can be relied upon to ensure that the people of the U.S. will have affordable telecommunications services.

Although the federal government should not set local telephone rates, it should set standards for interconnection and accounting procedures so the Universal Service Compensation Fund proposed under the act can determine the proper costs of all services used in common and connected to the intercity networks of the telephone system.

The fund, which would apply equally to all carriers, would eliminate the present so-called settlements system in which some carriers individually negotiate their costs with others while the specialized carriers such as South Pacific Communications are excluded.

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Thwarted Plans to Centralize

Middle Management Hit for Interior's DP Ills

By Brad Schultz
CW Staff

WASHINGTON, D.C. — Top DP management at the U.S. Department of the Interior had a plan to eliminate the "underuse and duplication" of computer resources of which a recent General Accounting Office report complained [CW, July 10], but it was thwarted by the department's middle management, according to Interior's highest ranking DP official.

A plan to replace a number of the DP facilities serving Interior's component agencies in the Denver and Washington, D.C., areas with one large-scale DP complex in each area was adopted by top officials as early as 1975, Harris G. Reiche said. But the managers of certain computer installations that would have been eliminated by the consolidation resisted the effort by refusing to provide the necessary "operational" planning, the director of the Office of Automated Data Processing and Telecommunications Management claimed.

The GAO study found that in Denver alone, $20 million to $25 million was lost over a period of five years by underuse and duplication of computer resources, which it attributed to a lack of careful planning and the acquisition and use of those resources.

Other informed sources have corroborated the study's conclusions. One observer spoke of personal "fiefdoms" functioning with considerable waste under the DP chiefs of the several Denver bureaus.

Major Obstacle

The major obstacle to a rehabilitation of Interior DP has been refusal of DP line management to provide the necessary plans for centralization and their continued activity in the opposite direction — towards specialization — through acquisitions and systems development, Reiche asserted.

The necessary "strategic" planning — from Interior's "corporate" level — has been under way since guidelines for DP centralization were set by the department's Executive DP Review Board in 1975, Reiche said.

The review board, for which Reiche served as technical advisor, projected at that time that by 1980 there would be seven Interior DP centers in the vicinity of Denver and four near Washington, D.C. It decided to consolidate computer resources into two large-scale, compatible DP complexes, one in Denver and the other in the Capitol.

"Naturally there was considerable resistance at the bureau level to that idea because it was 'stepping on turf' — taking away autonomous computer centers from the department," Reiche recalled.

So bureau management refused to cooperate, he said, prompting Reiche to tell the board in 1976 that its strategy was not working.

Top Post Vacant

The review board was chaired by the Assistant Secretary for Management (now Policy, Budget and Administration) and entirely comprised of assistant secretaries representing the various needs of Interior DP users.

Soon after Reiche's statement to the board, the Assistant Secretary for Management — Reiche's boss, who had favored centralization — returned to industry and two other board members circulated letters repudiating their earlier support of the effort. The board never met again.

The top management post was vacant for three months and then filled by the manager of President Ford's 1976 campaign for five western states, Reiche said. However, he added, the Ford appointee was preoccupied with national politics and showed little interest in Interior's DP problems throughout his tenure.

President Carter's nomination for the job was withdrawn because the nominee faced civil action in California that made Senate approval doubtful, another Interior spokesman said. Carter has made another choice, which will be officially announced soon.

Office Function 'Diluted'

The GAO report concluded that "top [Interior] management was not sufficiently involved or committed to . . . control of these vital [DP] resources."

Reiche expressed agreement with this point and also with another GAO conclusion: that Reiche's office "had insufficient resources and authority" to address Interior's DP woes.

Reiche explained that the office he was hired in 1974 to set up as the department's first central DP management unit has been whittled down in size and "diluted" in function because of neglect or poor judgment at the department's assistant secretary level.

Originally intending to learn how to best evaluate a federal agency's DP planning practices, the GAO began to study Interior's planning process as a model among the agencies, according to GAO Assistant Director George Sotos.

Spokesmen for the DP operations of two Denver Interior bureaus claimed their houses are in order and denied there was resistance to centralization policy among their ranks. Officials with the other Denver bureaus declined to comment.

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Hoagland Takes Over Afips President's Gavel

MONTVALE, N.J. — The American Federation of Information Processing Societies (Afips) has inaugurated Dr. Albert S. Hoagland as president, J. Ralph Leatherman as vice-president, Dr. Sylvia Charp as secretary and Walter A. Johnson as treasurer.

These officers now serve on the Afips board of directors and on the organization's Executive Committee.

Hoagland has served as Afips vice-president and as a chairman of the National Computer Conference board. With IBM since 1956, the manager of advanced recording media at the San Jose Research Laboratory is also a past president of the Institute of Electrical and Electronics Engineers/Computer Society.

Leatherman, a member of the Afips Washington Activities Committee and chairman of the Afips Admissions Committee, has held high offices — including the international presidency — in the Data Processing Management Association.

He is currently manager of information services for Hughes Tool Co. in Houston.

Charp is a member of the Afips Education Committee and chairs the federation's New Activities Committee. Johnson is a member of the Afips Finance Committee and treasurer of the NCC board.

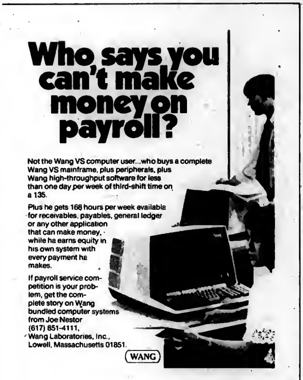
Societies/ User Groups

In other Afips news, the federation has issued a call for participation in the 1979 NCC, set for New York City.

All individuals concerned with DP and computer science are invited to "write a paper, propose a technical panel or session, volunteer to be a panelist, send ideas for topics or suggest special activities, demonstrations or conference features," Afips said.

As for the 1978 show in Anaheim, Calif., Afips reported final attendance figures showed 57,240 persons attended that event — up fom the 1977 NCC attendance of 35,601. Records were set at Anaheim for the number of participating organizations — 350 — and the number of exhibit booths — more than 1,400, according to Afips.

NCC '79 will be held June 4-7. Information on program guidelines and requirements for presented papers can be obtained from Afips headquarters, 210 Summit Ave., Montvale, N.J. 07645.



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September in Boston

Focus on DDP Management Set

BOSTON — A two-day conference focusing on management problems and solutions associated with the development of distributed data processing (DDP) systems will be held here on Aug. 24-25 and in Washington, D.C., on Sept. 25-26.

The seminar, jointly sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and the Data Processing Management Association (DPMA), will address such issues as data partitioning and allocation, design tools and techniques and verification and validation.

The session will also discuss fault isolation, system reliability and the impact of microtechnology.

The conference is designed for executives, managers and senior systems analysts.

Registration fees are $325 for AIAA and DPMA members, $345 for nonmembers and $245 for government personnel.

Registration information is available from P.O. Box 91295, Los Angeles, Calif. 90009.

Privacy Laws Compiled in Book

WASHINGTON, D.C. — More than 400 state and federal laws that regulate recordkeeping about individuals are described in a book published by the *Privacy Journal*, an independent monthly magazine focusing on computers and privacy.

The 166-page volume, updated annually, lists more than 30 laws enacted during the past 12 months that protect the confidentiality of personal information, a spokesman explained.

The book centers its attention on topics concerning criminal information, financial and tax records, school records, government data banks, Social Security numbers and medical files.

Wiretapping and polygraphing are also discussed in the book, the spokesman stated.

The publication is available for $14.50 from *Privacy Journal*, P.O. Box 8844, Washington, D.C. 20003.

Call for Papers

THE FOURTH INTERNATIONAL SYMPOSIUM ON COMPUTERS, ELECTRONICS AND CONTROL (CEC '78), Toronto, November 1-3, 1978.

The symposium will cover computers (software, hardware, architecture, technology, mini and microcomputers, distributed processing, data communications, applications), electronics (circuit design, computer-aided design, filter design, instrumentation, applications) and control (modeling, identification and estimation, optimal and adaptive control, nonlinear systems, computer control and applications).

Three copies of a 200-word abstract should be submitted by Aug. 15 to Prof. K.C. Smith, chairman, Department of Electrical Engineering, University of Toronto, Toronto, Ont., Canada M5S 1A4.

COMPUTER NETWORKING SYMPOSIUM, National Bureau of Standards, Gaithersburg, Md., Dec. 13, 1978.

Included in the range of symposium topics are architecture, application, authentication techniques, communications networks, design techniques, economics of networks, encryption techniques, interfaces, interoperability, interprocess communications, local data networks, measurement, modeling and simulation, network security, protocols, reliability, requirements specification, standards and survivability.

Authors should send a 1,000-word abstract to Dr. George Cowan, Computer Sciences Corp., 6565 Arlington Blvd., Falls Church, Va. 22046 as soon as possible.

1978 CAUSE NATIONAL CONFERENCE, New Orleans, Dec 12-15, 1978.

Papers are invited on topics relating to the development, use and management of information systems in higher education.

Authors should send an abstract of not more than 250 words to Cause, 737 29th St., Boulder, Colo. 80303 as soon as possible.

TWELFTH HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES, Honolulu, Jan 4-5, 1979.

Papers are invited in the following areas: computer-based decision support systems, software engineering, minicomputer and microcomputer systems, medical information systems, justice information systems and distributed processing systems.

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Anaheim Sharing DP Resources With 11 Cities

By Ann Dooley
CW Staff

ANAHEIM, Calif. — To cut costs, the city DP department here is practicing a "unique computer resource-sharing system" with 11 other southern California cities.

The number of cities in the sharing program may double over the next three years, partly because of the need to cut costs sparked by the recent passage of California's Proposition 13.

There has always been an interest in the shared system, according to Tug Tamaru, Anaheim's DP director, but Proposition 13's passage increased the number of calls asking for Information about the system. People are very concerned now about the best ways to save money, he added.

The Anaheim DP center services almost all of Anaheim's city departments by providing a utility billing system and an on-line integrated business package that includes the usual applications — general ledger, accounts receivable and accounts payable, for example.

The department also provides a payroll/personnel system; an on-line library circulation system; a fire system which includes a fire prevention and reporting system as well as a comprehensive fire station locating system; and, finally, a complete police statistic system (see Page 13).

Two years ago, the department began serving the needs of surrounding towns and counties with no DP facilities of their own. Although not yet as comprehensive as the Anaheim system, the standard package for the other cities in the sharing program includes a payroll/personnel system, a complete financial system, a business/license tax system and a utilities system.

A data center is being designed to handle the expanding needs of the system, and hardware upgrades and new applications are also being planned. Cities currently in the program are located in the counties of Los Angeles, San Bernadino, and Orange, but cities as far north as Santa Barbara have expressed interest, Tamaru said.

Sixty people are currently on the DP staff, although that, too, will undoubtedly increase as the sharing program grows, Tamaru said. All the members of the staff are experienced with city systems, which is the key to supporting customers, he added.

Anaheim's system includes a 1M-byte IBM 370/145, 12 IBM 3330-2 disks, six magnetic tapes, two high-speed Documation, Inc. printers and 60 terminals at sites throughout the state. Thirty terminals are IBM 3270s and 30 are Trendata, Inc. Model 2741s. The Trendata typewriter-type terminals will eventually be replaced by CRTs, Tamaru said.

The whole program is heavily oriented to on-line and terminal systems, and that will continue to be the trend in the future, he added.

The various departments input their data or update their files via terminal and can expect overnight turnaround time for such applications as the personnel payroll system, Tamaru said.

The shared program is operating at a total cost of $1.8 million, well below the national average for city DP budgets, according to Tamaru. The city DP department is recovering 42% of that money by charging a unit cost for resource allocation of software to the participating cities.

Tamaru attributed the program's success largely to the support received from city officials, which he said is so important to getting any program off the ground.

Correction

In "Five-Minute Tapes Offered by Microsette" [CW, July 17], an error was made in the price quotation. The 50-ft C-10 tapes cost $7.50 for 10 packs from Microsette Co., 777 Palomar Avenue, Sunnyvale, Calif. 94086.

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CW7318

Provides Reports and Maps

System Shows Police Where to Deploy Patrols

By Ann Dooley
CW Staff

ANAHEIM, Calif. — City police here have reported more arrests since the police department implemented a computerized crime statistics system in order to deploy police officers into high crime areas.

The police department's on-line system, based on the city's IBM 370/145, provides crime statistics and patterns on all recent Part I crimes — homicide, rape, robbery, assault, burglary, larceny and motor vehicle theft.

On-line IBM 3270 terminals at police headquarters are used for entering statistics on the kind of crime that occurred, the time of day and the location. The terminals are also used to update files and display crime records as additional data is obtained.

The mainframe generates the accumulated crime statistics on a weekly basis and also provides maps that show where certain kinds of crimes were committed or where fewer crimes took place.

Past, Present Crimes

The management information system records both past and present crimes and is used to make more efficient use of the police patrols, according to Tug Tamaru, DP director for the City of Anaheim.

In addition to the reports on crime statistics, the system provides the monthly reports required by state and federal crime agencies.

Batch processing is used to produce the required Bureau of Criminal Statistics reports, as well as management reports that analyze different aspects of criminal activity. Two copies of the crime statistics reports are sent to the bureau for the State of California and one copy is forwarded to the Federal Bureau of Investigation.

The Model 145 is programmed to use a city identification code along with the departmental report number so the system can be adapted for use by different cities.

Three Reports

Three types of reports are produced: Return A, which contains statistical data pertaining to the Part I crimes; a property stolen classification, which contains the dollar values of property associated with the crime; and a supplement to Return A, which contains the dollar values of stolen and recovered property.

Other management reports are compiled to provide specific sets of information, and when they are analyzed they present a comprehensive analysis of criminal activity, both past and present, according to Tamaru.

The reports produced include a Crime and Clearance Analysis — a two-part report that provides the number of reported offenses by category of crime — which is used to report month, year to date, previous year to date and percent of change, Tamaru said. This report includes total offenses as well as juvenile offenses.

Another report includes a time-of-day and day-of-week analysis by type of crime and location. An additional reporting program allows for the exact placement of crimes by type.

Unsolved crimes are included in a fourth management report, which lists by type any outstanding departmental reports, Tamaru said. A final report covers robbery, burglary and larceny comparisons by premise type and crime category, both on a year-to-date and previous year-to-date listing.

Any of the reports can be produced within any time frame in addition to the regular monthly calendar listings.

Besides the crime rate analysis, the system will identify the location of reported crimes by census tract and exact address. Computer-drawn maps are produced on one of the city's high-speed Documation, Inc. printers to show the exact or general location of crimes.

The maps can be generated in either the shaded census tract or according to the type of crime, date or time span.

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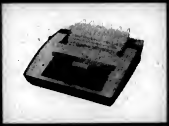

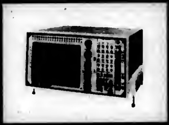

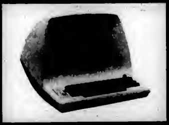

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EMS: Why The Delay?

By Philip S. Nyborg

A Public Policy Proposal for EMS

First, the monopoly granted to the Postal Service in the Private Express Statutes should not be extended to encompass the transmission of electronic messages. All Generation III electronic message services and the electronic link in Generation I and II electronic message services would be open to competition.

This would be the case whether or not such services might shift demand, as did long distance voice telephone, from the Postal Service.

Second, the Postal Service should not be an underlying vendor or developer of EMS terminal equipment, switching devices, transmission services or entire EMS. The term "underlying" is used here in the same sense in which it is used in the common carrier industry with respect to transmission services: to distinguish firms which actually produce the service or product from those which may purchase and resell the service or product.

Third, and very important, whether a given electronic system, service or piece of hardware is subject to regulation should be solely determined by the Federal Communications Commmission (FCC). This contemplates continuation of existing procompetitive FCC policies.

IN DEPTH

IN DEPTH

IN DEPTH

The world of digital communications holds much promise for the user, but the innovations coming out of its laboratories are taking a long time to get to those they are meant to benefit. What's holding them up?

New service offerings in digital communications are mired in a highly complex and inconsistent set of federal regulations. The present overlap of regulatory jurisdictions concerned with electronic message systems (EMS) illustrates the seriousness of this problem in an important new service area.

The term "digital communications" is used here for two reasons — first, to broadly encompass not only computer-to-computer or terminal-to-computer communications, but also communications between persons utilizing a digital pathway. This definition does not distinguish whether such digital information represents character-encoded data, facsimile or even voice.

Secondly, the term underscores the very real fact that it is our technology, computer technology, which is the driving force in communications innovation.

There are essentially three federal regulatory domains which affect digital communications generally and EMS specifically. Each has been created by a separate statutory framework which, for the most part, predates the invention of the first computer.

The first domain is the Federal Communications Commission (FCC) and the underlying Communications Act of 1934. The FCC was initially created to deal with voice telephone and telegraph in one bureau and radio in another.

The second is the U.S. Postal Service and the underlying Private Express Statutes. Pursuant to the government's constitutional power to establish a postal system, these laws were enacted to give the Postal Service a monopoly in the carriage of letters, periodicals and parcels.

The third domain is the federally regulated banking domain, which is itself a complex tripartite structure in which national banks are regulated by the Comptroller of the Currency, Federal Reserve Banks by the Federal Reserve Board and savings & loans institutions by the Federal Home Loan Bank Board.

The services contemplated by the underlying statutes in each of these three domains originally were easily distinguishable. Voice telephone, telegraph, radio, the conveyance of letters and the movement of banking paper were sensible distinctions.

Fourth Domain

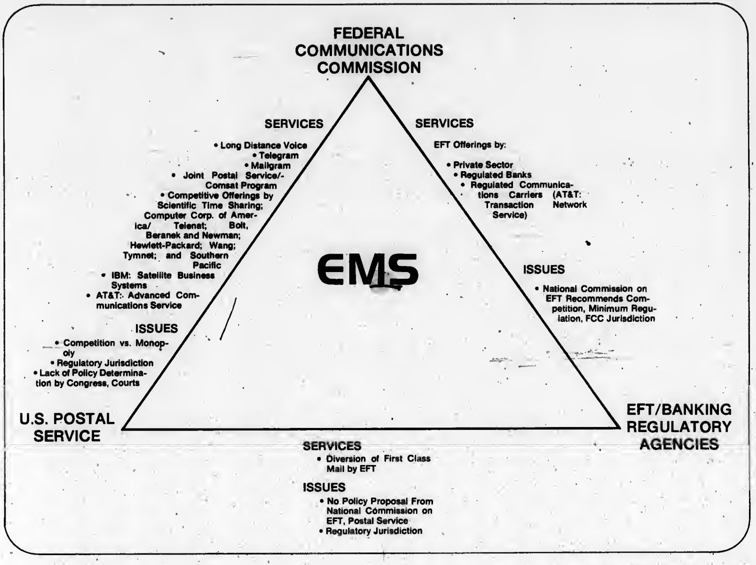
The foregoing, however, describes only federally regulated industries. The private competitive sector provides a fourth domain, which is not regulated. The definitional problems here are exemplified by the FCC's current Computer Inquiry, its second effort to draw a distinction between regulated communications and unregulated data processing.

This docket, however, is certainly not the only area in which an important, indeed critical, dichotomy is being made between competitive and regulated monopoly markets.

The distinction between DP and communications, like the boundaries between the three regulatory jurisdictions, was reasonably clear in the context of earlier technology. Current technology, however, has driven similarities to the point where the ultimate distinction must be made on public policy rather than technical grounds.

Beyond blurring the boundaries between traditionally distinct services, digital technology has also provided significant new electronic alternatives to paper-based systems. It has allowed an unprecedented degree of substitution of one service for another and permitted demand shifts not only from market to market, but from regulatory jurisdiction to jurisdiction.

Multiple regulatory agencies have become interested in particular electronic services, either on grounds of jurisdiction (for example, electronic banking communications) or based on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IN DEPTH

IN DEPTH

IN DEPTH

the fact that one service substitutes for another.

Economic Concentration

Before examining the specific service overlaps between these regulatory jurisdictions, it is important to point out the sheer economic magnitude of the larger companies involved in this arena and the associated phenomenon of economic concentration. The Forbes Sales 500, which lists both industrials and utilities, mentions each of the following players among the 12 largest corporations in the U.S.:

- No. 2 at $54 billion, Exxon (which offers Qwip and Qyx through its subsidiary Exxon Enterprises).
- No. 4, AT&T at $36 billion.
- No. 9, IBM (a player both directly in data processing and in communications through its joint venture subsidiary, Satellite Business Systems [SBS]) at $18 billion.
- No. 12 (although not listed by Forbes), the U.S. Postal Service with a current budget of $17 billion.

It is significant that two of the four — AT&T and IBM — are defendants in two major antitrust suits brought by the federal government which are currently pending and that the Postal Service, like AT&T, is a government-regulated monopoly.

Now, to be specific. Taken one pair at a time, there are three significant sets of overlap in regulatory jurisdiction between the three federal domains which have been described.

FCC and the Postal Service

First, there are services of regulatory concern to both the FCC and the Postal Service. One of the earlier examples of this was long distance voice telephone competing for markets traditionally served by mail. In that case, while there was clearly a substitution effect, the Postal Service obviously could make no claim that the replacement telephone conversation was a form of mail.

The report of the Commission on Postal Service documented shifts in demand from postal service to telephone. In 1945, the post office transmitted 35% and the telephone industry 65% of all messages, in 1973, the post office handled 20% and the telephone industry 80%.

Telegraph service has also been a matter of interest to both the FCC and the Postal Service. As late as 1923, congressmen were proposing that, through the Post Office, the government assert monopoly powers over all forms of electrical communications.

In 1941, the Domestic Telegraph Merger Act granted Western Union a de facto monopoly over the domestic telegraph business. Postal regulations as well as postal legislation which has recently been approved by the House of Representatives specify that a telegram does not constitute a letter or mail.

There is also Western Union's Mailgram service, which is a joint effort between Western Union (as a record carrier) and the Postal Service. Mailgram revenues are now about $60 million, and Western Union has formed a subsidiary, Western Union Electronic Mail, which provides additional services for Mailgram customers. The latter is not part of the tariffed offering of the parent.

Joint Venture

Another example in this area is the million-dollar Postal Service experiment which will test an electronic message service in a joint effort with Communications Satellite Corp. (Comsat). The service is to transmit messages between the U.S. (probably New York or Washington, D.C.) and five or six other countries. The project calls for a one-month demonstration next February 1979, followed by a one-year field trial to determine market potential.

Postmaster General William Bolger has stated that the Postal Service is currently considering how it might usefully become involved in electronic transmission systems within the United States. Comsat, of course, is an international carrier regulated by the FCC.

The issue of regulatory jurisdiction regarding the Postal Service's initial

(Continued on Page 16)

(Continued from Page 15)

foray into electronic services is significant, but does not even approach the importance of the threshold public policy question which has never been determined; whether such services should be provided competitively by the private sector.

The issue is not merely whether the Postal Service should become a resale carrier or whether existing carriers might enter joint ventures with the Postal Service; it is fundamentally whether such new and innovative services should be provided competitively by the private sector, with minimal or no federal regulation.

Brief Divergence

It is useful here to diverge briefly to discuss a term which is badly misused. That term is "electronic mail" and it is inappropriate for two reasons.

First as Marc Porat pointed out at the 1978 Airlie House conference on telecommunications policy, it is analogous to the term "horseless carriage" in that it names a dynamic new technology in terms of a technology which is becoming obsolete.

Second, the term *presupposes* that such services are within the domain of the Postal Service and the Private Express Statutes. While continuing to use the term "mail" for mail, we will use the term "electronic message services" to describe digital communications between human beings which may be either point-to-point or switched and which may represent character-encoded information or facsimile.

A number of innovative private sector companies are presently offering electronic message services. Scientific Time Sharing Corp. (STS), which has provided a time-sharing service based on the APL language since 1969, has offered an EMS for several years. STS has filed with the FCC under Section 214 of the Communications Act for authority to offer its message-processing system as a resale common carrier.

The Computer Corp. of America has offered its Computer Message Transmission System software since 1975. This system is offered both as a time-sharing service and as a turnkey package for intracorporate installation.

Telenet Communications Corp. has been acting for some time as a network for EMS, including the Hermes software offered by Bolt Beranek and Newman, Inc. More recently, Telenet has received FCC authorization to introduce its own electronic message service.

Both Hewlett-Packard Co. and Wang Laboratories, Inc. offer EMS which are a combination of hardware and software. Tymnet has been offering its Ontyme service as a resale common carrier since July 1977, and the Southern Pacific Communications Co. has filed a tariff for an experimental switched facsimile service.

Finally, a number of organizations have sophisticated internal systems, including the Department of Defense (the pioneering Arpa net), Citibank, Cook Industries and AT&T (administrative data network).

The entry of the corporate giants into electronic message services has not yet occurred on a major scale, although it is imminent — AT&T, for example, recently filed its Advanced Communications Service with the FCC [CW, July 17] and IBM is moving ahead with Satellite Business Systems (SBS).

> **'The issue of regulatory jurisdiction regarding the Postal Service's initial foray into electronic services is significant, but does not even approach the importance of the threshold public policy question which has never been determined: whether such services should be provided competitively by the private sector.'**

ACS has been proposed as a digital network based on packet-switching techniques. Its customers would subscribe to computing resources at local ACS nodes.

Users would be able to program their own applications using a high-level feature definition language or to license applications software for (among other applications) text editing, report generation or file maintenance. As proposed, ACS will have a store-and-forward capability, affecting existing resale carriers as well as private networks which support time-sharing EMS.

In addition to raising EMS-related regulatory questions, the services which are reported to be part of ACS clearly go beyond the FCC's existing and proposed definitions of communications, into the domain of DP; that is, into the DP marketplace. AT&T's offering of ACS should be met with very serious concern by competitive firms in the computer industry.

IBM's SBS is seen by Howard Anderson of The Yankee Group as one of the major potential entrants into the EMS market. Speaking to the Computer & Communications Industry Association in 1977, Anderson described SBS as competing not simply with traditional mail, but as more directly trying to expand and capture the private-line segment of the interstate telecommunications market by shifting business user demand from Bell's MTS and Wats telephone services.

The key to this strategy, Anderson said, is shifting users away from simultaneous communication by telephone during prime hours toward

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nonsimultaneous communications — that is, electronic message services — for the large majority of intra- and intercorporate messages not absolutely time critical.

In 1976, the interstate telecommunications market totaled $11 billion. Private-line services accounted for only $1.4 billion of this — the market in which MCI Communications Corp. and Southern Pacific compete. Business MTS and Wats service, on the other hand, accounted for $5.6 billion and are considerably more profitable to AT&T than private-line services, including Telpac. Thus EMS represent a threat to a larger AT&T market than private-line services.

Three EMS Classes

Finally, there are significant regulatory tensions between the Postal Service itself and FCC regulation. In 1975, the Postal Service requested the National Research Council to undertake a study of EMS with the objective of recommending "appropriate research, development and applications of this new technology for the nation's mail service."

The report distinguished between three classes of electronic message systems:

- Generation I, in which all mail will be handled physically except for selected electronic links between major postal installations.
- Generation II, in which mail would be converted to electronic messages at postal installations near the originator and be converted into hard copy at a postal installation near the recipient. This is essentially the Mailgram type of service.
- Generation III, which would be a *completely electronic transmission* in which hard copy may or may not be produced; the information flows from originator to recipient only in electronic form. Generation III mail, according to the report, could involve existing distribution networks or the development of a new distribution network.

The report recognized it is not necessary and may not be desirable for the Postal Service to own and operate a complete message system. While taking the position that regulatory issues related to generations I and II could be dealt with under existing regulatory procedures, the report also recognized that "Generation III will undoubtedly raise difficult and complex national policy issues concerning competition and regulation."

Accordingly, the report concluded that the Congress should at the earliest opportunity address the adoption of a policy on electronic messages services that best serves the nation, the alternative being a test in court.

Incredibly, despite this early recognition and clear recommendation, the Postal Service is now developing its own EMS, without such national policy issues having been determined by either the Congress or the courts.

The second area of important regulatory tension is between the Postal Service and banking regulatory agencies.

The recent report of the Postal Commission cited an Arthur D. Little, Inc. estimate that 23% of all first-class mail will have been diverted by 1983 to electronic communications and noted that financial transactions are the most vulnerable to such diversion. These diversions occur not only with respect to checks, but also with mail associated with checks, such as bills, invoices and receipts.

The report estimated total first class mail diversion resulting from electronic funds transfer (EFT) systems to be 1.9 billion pieces by 1980 and 6.5 billion pieces by 1985.

Although a high-level Postal Service official testified before the National Commission on Electronic Fund Transfers that EFT development "would divert valuable mail and revenues from a postal system already beset by financial problems," there is no significant discussion of this issue in the commission's final report, issued Oct. 28, 1977. One is left to question the outcome, should the Postal Service press the claim that most EFT is within the Private Express Statutes and therefore subject to Postal Service regulation.

Banking Agencies and the FCC

The final report of the National Commission on EFT, however, did devote considerable attention to the third regulatory overlap — the one between electronic banking and the FCC. In Chapter 10 of its report, the EFT commission noted technological advances in computer and communications technology, which it described as the infrastructure of EFT systems, and declared "it is no longer certain which services should be regulated as communications services . . . [n]owhere is the problem more evident than in existing and emerging EFT systems.

The Commission observed that "EFT is developing in a market environment in which unregulated data processing companies compete, to a degree, with regulated communications carriers. Thus it is virtually impossible to determine a priori whether an EFT network or service will be subject to both financial and communications regulation."

The EFT commission's primary recommendations in this area were that:

- All interested parties should be allowed to compete in the EFT terminal and system marketplace.
- Only the underlying communications transmission and distribution (transparent) facilities used with EFT systems should continue to be regulated (and then only as long as such regulation is considered necessary by appropriate state and federal agencies).

In essence, the commission recommended that EFT systems not be regulated as communications carriers, although they should be permitted to utilize communications carrier services where necessary. The commission was not entirely consistent in this position, it should be noted, since it did recommend the government continue to operate electronic switching facilities between depository institutions.

Accordingly, the Federal Reserve Board recently issued final approval for a nationwide interconnection of automated clearinghouses.

Another major factor in the EFT/FCC overlap is AT&T's offering of the Transaction Network Service (TNS) and associated terminal devices.

As of 1977, AT&T had tariffed EFT terminal devices in 48 states. As noted by John Eger in an article in the May, 1977 issue of *Datamation*, AT&T has circumvented FCC regulation in establishing TNS by tariffing it on an intrastate basis, on the grounds that banking is an intrastate business. This, despite the recognition in the EFT commission's Working Document No. 44 that EFT "is not inherently intra-

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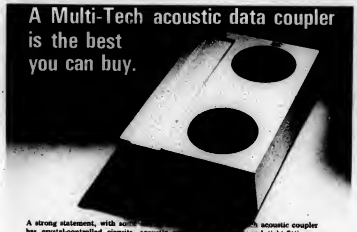

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(Continued from Page 17)

state in nature." The document recommended federal legislation which would preempt the role of the states in tariffing EFT terminals.

Now that we have looked at the issues around regulatory jurisdiction, it's important to focus on an even more crucial question — namely, whether a particular service should be subject to regulation at all.

Communications monopolies, regulated by the FCC or the Postal Service, have traditionally been predicated heavily upon the need for universal service as well as upon the economic characteristics of the industry involved. In the communications field, the FCC has recognized public interest can be well served by competition in the provision of certain communications services; the courts have repeatedly affirmed the FCC in this recognition.

This public interest policy rests fundamentally upon the premise that competition leads to greater consumer choice, as well as lower prices from the efficiencies inherent in a competitive marketplace. The policy also recognizes the great cost of government regulation not only in the budgets of regulatory agencies, but also in the enormous resources which regulated, potentially regulated and nonregulated firms must apply to regulatory and administrative proceedings.

The competitive question should be the *first* issue, the threshold question, addressed by federal regulatory agencies. The multijurisdictional problems, obviously, become significant only where an initial determination has been made that monopoly in lieu of competition is desirable in the public interest.

Sen. Edward Kennedy (D-Mass.) recently affirmed an extraordinarily important principle in reintroducing his Competition Improvements Act (S. 2626) in the present session of Congress. As described by Kennedy at a recent meeting of the Computer & Communications Industry Association, the bill was drafted to discourage unjustified and unnecessary anticompetitive regulation.

The bill would complement various reform efforts related to particular regulated industries, identifying areas where regulation is no longer appropriate. While recognizing that some areas within the economy legitimately require regulation, the bill would make it mandatory that an agency contemplating an action which would substantially affect competition must first make a finding that:

- Such action is necessary to accomplish an overriding statutory purpose of the agency.
- The anticompetitive effects of such action are clearly outweighed by the significant and demonstrable benefits to the general public.
- The overriding statutory purpose cannot be accomplished in substantial part by alternative means having lesser anticompetitive effects.

The senator noted that "the computer and communications industries present the most critical challenges today for the viability of national competition policy and antitrust enforcement. They also provide fertile proving grounds for innovation and imagination on the part of the government and the courts."

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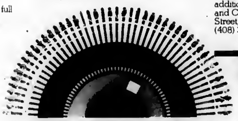

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In the context of current Postal Service legislation, it is useful to examine how EMS might be appropriately treated in the complex regulatory environment which has been described. The following analysis assumes, alternatively, the passage or absence of Kennedy's legislation.

A bill, H.R. 7700, has recently been passed by the House of Representatives (and similar legislation is under consideration by the Senate) that would have required the Postal Service to devote 2% of its total budget, $360 million annually, to research on EMS. This was done without a threshold public policy determination in *any* forum (Congress, court or agency) that a postal monopoly, rather than competition, serves the public interest with respect to EMS.

It has never even been determined that the public interest justifies the postal monopoly in competing in EMS, much less justifies having a total monopoly on some segment of the EMS marketplace.

Rep. Lionel Van Deerlin, chairman of the House Communications Subcommittee, persuaded co-sponsors of the bill to delete the section earmarking specific funding for Postal Service research on EMS. However, because the bill does not affirmatively *prohibit* Postal Service research on EMS, the governmental monopoly will continue to develop its prototype EMS in its research facility in Rockville, Md; it is expected to be ready for testing in 1981.

Let us apply the analysis required in Kennedy's bill to the Postal Service debate. Is such action necessary to accomplish an overriding statutory purpose of the agency? It is argued below that the electronic movement of information is not within the Postal Service's present statutory mandate. However, even if the Congress *were* to grant the Postal Service a statutory mandate which encompassed electronic message services, are the anticompetitive effects of such action outweighed by the public interest?

There is, of course, a public interest in the efficient universal distribution of mail although, as will be discussed, the Postal Service need not develop its *own* EMS facilities in order to achieve this objective.

Finally, can the objectives of the Postal Service be achieved by alternate means having fewer anticompetitive effects? Here the Kennedy legislation introduces an extremely important principle: Even recognizing the financial difficulties of the Postal Service, it is not justifiable to sacrifice a competitive market (EMS) solely to keep the Postal Service financially viable.

Stated alternatively, there is no justification for placing the burden of a service — the physical distribution of mail which benefits the nation at large — upon a particular competitive marketplace, such as that for EMS.

However, lacking additional legislation such as the Competition Improvements Act, what is the appropriate treatment of EMS within the complex regulatory environment?

The first step in the analysis must be whether the electronic movement of information is within the Postal Service's statutory mandate. The Private Express Statutes grant the Postal Service a monopoly in the carriage of mail by making it a criminal offense to establish a private express for the "conveyance of letters."

A "letter" in current Postal Service regulations is defined as "a message directed to a specific person or address and recorded in or on a tangible object." As noted earlier, however, a telegram is not a letter within the current regulations, and H.R. 7700 would strengthen the exclusion for telegrams by incorporating the present regulation into the statute.

With respect to the transmission of messages by telephone or electronic . .

(Continued on Page 20)

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(Continued from Page 19)

communication links, an assistant general counsel of the Postal Service has issued a ruling as follows:

"A letter is a message directed to a specific person or address and recorded in or on a tangible object . . . A message, while being sent by telephone or electronic communications links, is not regarded as recorded in or on a tangible object. Therefore, while being so transmitted, the message is not considered a letter within the meaning of the statutes and regulations and the Private Express Statutes and regulations do not apply.

"If a message transmitted by telephone or electronic communication links is at some time reduced to a 'hard' copy, [the] . . . copy could, depending upon the nature of the message and the method of carriage, become subject to the Private Express Statutes and regulations if it is privately carried over post routes."

One can conclude on the basis of these definitions that an end-to-end (that is, Generation III) electronic message service is not within the scope of the Private Express Statutes. One can further conclude, however, that the electronic link in Generation I and II services is similarly not within the scope of the Private Express Statutes.

This has two important ramifications:

(1) The electronic link in a Generation I and II service and all Generation III services with respect to the Private Express Statutes is open to competition.

(2) While the Postal Service does have a monopoly in the physical movement of letters, it has no explicit statutory authority to transmit (convey) electronic messages. This conclusion applies to both the end-to-end electronic transmission in a Generation III service as well as the electronic link in a Generation I or II service.

There are those, including within Congress and the executive branch, who would disagree with these conclusions. The point is that these issues have never been authoritatively decided (although positions have been taken by various executive branch groups, including the Postal Service) by either the courts or by Congress through more definitive legislation.

A public policy determination needs to be made, and hopefully it will involve the innovation and imagination urged upon us by Kennedy.

A Public Policy Proposal

I would offer here a proposal with respect to this very important public policy determination. It essentially breaks down into three parts:

First, the monopoly granted to the Postal Service in the Private Express Statutes should not be extended to encompass the transmission of electronic messages. All Generation III electronic message services and the electronic link in Generation I and II electronic message services would be open to competition.

This would be the case whether or not such services might shift demand, as did long distance voice telephone, from the Postal Service.

Second, the Postal Service should not be an underlying vendor or developer of EMS terminal equipment, switching devices, transmission services or entire

(Continued on Page 22)

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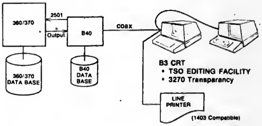

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EMS. The term "underlying" is used here in the same sense in which it is used in the common carrier industry with respect to transmission services: to distinguish firms which actually produce the service or product from those which may purchase and resell the service or product.

While I do not intend to propose whether the Postal Service be allowed to purchase and resell such equipment, services or systems, I do intend to raise the resale issue.

Third, and very important, whether a given electronic system, service or piece of hardware is subject to regulation should be solely determined by the Federal Communications Commission. This proposal contemplates continuation of existing procompetitive FCC policies, and it should be stressed that this is not a call for additional FCC regulation.

Rather, it is a suggestion that if a regulatory issue must be resolved with respect to electronic services or equipment, only the FCC should have jurisdiction, not the Postal Service or any other federal agency.

The merits of this proposal have essentially already been embraced with respect to banking systems by the National Commission on EFT, which recommended that banking regulatory institutions should not have jurisdiction over communications services; that only underlying transmission services should continue to be regulated by the FCC and then only where necessary and appropriate; that EFT systems should not be classified as communications common carriers; and that terminal equipment should be totally deregulated except for compliance with the FCC registration program.

It is noteworthy that this approach does more than solve a regulatory jurisdictional problem. Regulatory uncertainty has a substantial "chilling" effect on high technology firms which might enter a new marketplace such as electronic message services. There is no practical way to measure the number of firms which have been inhibited from entering the electronic message service marketplace by such regulatory uncertainty or the number of banks that have refused to loan venture capital for the same reason.

While such uncertainty is a serious problem even with a single agency, such as the FCC, it is vastly greater in effect in the present regulatory environment, in which electronic message services are impacted by virtually all of the regulatory jurisdictions which have been discussed here.

The immediate ramifications of limiting regulatory jurisdiction to the FCC are the following. Intracorporate leased-line EMS networks which were not offered to the public would not be subject to regulation, although the providers of underlying transmission services would continue to be regulated.

Through a logical extension of the commission's rules relating to communications common carriers, if the Postal Service were similarly treated as a monopoly carrier (which, of course, it is with respect to the conveyance of letters), then any DP services it offered would be necessarily provided through an arms-length subsidiary to inhibit the flow of subsidy from monopoly services to competitive services. Terminal equipment would continue to be a competitive marketplace for both DP and communications terminals.

Perhaps most important, if this proposal as well as those of the EFT commission are adopted, providers of electronic message services would have one — not three to five — regulatory agencies with which to deal. And a continuing trend in the FCC's current policies would work very strongly in the direction of promoting competition where possible.

Even if the Postal Service is not per-

(Continued on Page 24)

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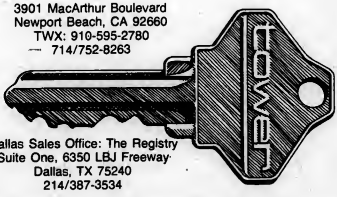

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IN DEPTH

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mitted to be a producer or developer of EMS, there remains a very difficult set of questions regarding the service's role as an *operator*, i.e., a reseller, of electronic message services. Allowing the Postal Service to procure electronic message systems, subsystems or components from outside sources is attractive in the sense that the *utilization* of such technology could help the efficiency and, therefore, the financial situation of the Postal Service.

But since Generation II electronic message systems are recognized as a logical step toward Generation III end-to-end service, we must examine the desired objective with respect to Generation III itself. When the system becomes an end-to-end electronic transmission, do we then operate two parallel systems, one for electronic messages and another network (which may be all-digital by that time) for voice and data? Do we continue in such circumstances to have two regulatory forums to decide questions of competition vs. regulation? Particularly where the issues regarding local distribution, long haul transmission, terminal equipment and DP vs. communications will be virtually identical?

To allow the Postal Service to become an operator of EMS is tantamount to inviting these results.

We are in the midst of a highly important era in regulation affecting the computer industry, an era in which the government is seriously asking itself whether new and innovative electronic services need be regulated. This question should be addressed in a single forum and with a coherent policy.

It is not necessary to have regulatory conflicts in this dynamic area, as has been recognized by the EFT commission; this approach makes sense; and it makes sense for the Postal Service as well as EFT. We are at a time when minimizing government regulatory intervention and making necessary regulation coherent and straightforward is critical to the future of computer communications technology in our country.

Philip S. Nyborg is vice-president and general counsel of the Washington, D.C.-based Computer & Communications Industry Association (CCIA), where he is principally responsible for industry regulatory matters.

Prior to joining CCIA this year, Nyborg served for three years as director of the Washington, D.C., office of the American Federation of Information Processing Societies (Afips) as well as Afips' special counsel.

Nyborg received his Juris Doctor degree from the University of Michigan Law School. He is a member of the Commercial Arbitration Panel of the American Arbitration Association.

He has also authored several articles on information policy.

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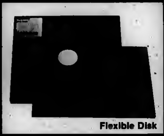
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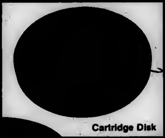
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Editorial

Human Rights in the USSR

President Carter's action in cutting off the sale of a computer system to the Soviet Union after the trial of Soviet dissident Anatole Sharansky [CW, July 24] was a welcome move.

The Sharansky trial was an absurd farce and a calculated blow against human rights in the Soviet Union, which claims adherence to the human rights guarantees in the Helsinki Declaration. Halting the sale of a computer system was particularly fitting in this case since Sharansky is a computer scientist who specializes in computer chess.

But the Administration hopefully will not stop with a ban on just this one sale.

The Soviet Union lags badly behind the U.S. in computer technology, and while denying that country access to such technology obviously won't bring it to a standstill, it can hurt it economically.

Future computer sales to the Soviet Union should be banned until that nation starts living up to the provisions of the Helsinki Declaration — and exports of needed grains and other technologies should also be stopped.

Diplomatic relations should, of course, continue, but all possible economic pressure should be exerted on the Soviets until not only is Anatole Sharansky freed, but also until other Soviet dissidents are allowed to speak freely and emigrate as they choose.

Human Rights Elsewhere

While President Carter's move to cut computer trade with the Soviet Union because of its human rights violations is welcome, the Administration's record elsewhere is not so good.

For example, U.S. computer manufacturers trade with impunity with the discriminating South African regime, with repressive Chile, with Eastern European dictatorships not known for granting human rights guarantees to their citizens and with black Marxist regimes in Africa which systematically supress certain out-of-favor minorities or tribal groups.

That's the problem with the Administration's human rights campaign — it is selective.

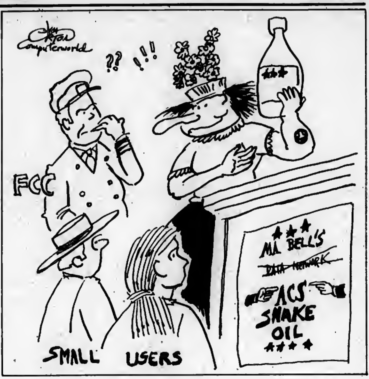
The Soviet Union makes an interesting target because the forces of the U.S. political left, right and center are outraged over its flagrant disregard for the Helsinki Declaration on Human Rights. There are therefore, few internal political repercussions in slowing trade in reaction to those abuses.

With the other countries, however, there are defenders. The U.S. right — always myopic — would react in horror if we stopped all trade with South Africa, even though it is certainly as repressive, if not more so, than the Soviet Union.

The U.S. left would not stand still for cutting trade with repressive leftist regimes in Africa — always finding some tenuous justification for repression of the right while reacting against the same repression on the left.

The great center really doesn't care.

Carter can therefore press his human rights campaigns only in those cases where the U.S. can internally coalesce on an issue. The human rights campaign should, however, apply equally to all if we as a nation are truly going to pursue it. A good place to start would be in the slowing of computer technology exports to the most flagrant human rights violators around the world.



Letters to the Editor

Los Angeles Voting System Not for Press' Benefit

Al and Ed Caras' allegation that taxpayers of the County of Los Angeles paid more than $1 million to speed up election returns to the press [CW, July 10] was simply not true.

During the June 6 primary election, the county DP department merely made available to the media a deck of punched cards exactly similar to those it was required to produce to transmit returns to the Secretary of State in Sacramento. The major Los Angeles morning newspaper utilized this service by installing a terminal, at its expense, at the county computer center to send the cards to its computer for processing the results.

The total cost to county taxpayers was a few dollars for the card stock, while citizens benefited by having available the complete returns in the morning newspaper on an election of extreme significance to Californians.

While a new election system was designed for that primary, that was done to accommodate a 312-position ballot to replace the 228-position ballot because of the large increase of candidates and propositions; it had absolutely nothing to do with speeding up the results to the media.

Robert A. Best
Former Director
DP Department
County of Los Angeles
Los Angeles, Calif.

Disservice to Readers?

"Series/1 Gets Cobol" on the July 3 issue's front page started off by saying that "Cobol [and other products] are now available to Series/1 users following an IBM announcement of 12 hardware and software enhancements to that system."

At the end of the story, however, it was stated that the Cobol package will not be available until May.

Treating IBM product announcements in this manner is a disservice to your readers, and it is not up to the standards that many of us have come to expect from *Computerworld.*

Robert Lichtarman
New York, N.Y.

IBM announces products well in advance of their delivery dates. It is no disservice to let readers know that IBM has announced a product and that the firm is taking orders for it. Only by signing up early can a user be assured of getting an early delivery of a product. Ed.

Two Points on Women

Concerning the National Computer Conference panel on women [CW, June 19] and the resulting letters, two points need to be made.

First, I did not say not to be feminine; those were *Computerworld*'s words. I said not to dress or act in a sexy manner and not to dress or act like a secretary, schoolgirl or housewife; I said to dress and act appropriately for the job sought.

Secondly, I did not say that women must emulate men or must always have a male superior. I said that women do not have many role models and, if lacking one, should key their dress, behavior and job attitude from the men in positions above them.

Lost somewhere along the way was the fact that I was addressing women engineers and not programmers, salespersons, consultants or any other DP job classification. Women engineers face a different set of problems, too many to list.

Women may wish the rules different, but they should remember it is much easier to change attitudes and company policies from the executive suite. My talk stressed how to get there with proper attire as only one aspect of my advice, and I spoke from a position of experience.

Donnamaie E. White
Sunnyvale, Calif.

Data Past

Five Years Ago
Aug. 1, 1973

WASHINGTON, D.C. — A secret White House data bank on more than 5,000 individuals was uncovered in a survey of governmental data banks conducted by Sen. Sam J. Ervin's (D-N.C.) Subcommittee on Constitutional Rights.

The file was maintained and updated on a Univac 1108 computer system at an undisclosed Department of Defense installation and was programmed in Fortran V, according to the Department of Emergency Preparedness.

— — —

FORT WAYNE, Ind. — A 19-year-old girl faced felony charges after she allegedly attempted to sell a service bureau's application software to a client.

Police charged Cynthia Crooks with obtaining copies of programs developed for a brokerage firm from her boyfriend, who worked as a computer operator in the service bureau. She then called the brokerage house, told its president she had copies of the program and offered to sell them to him for $2,000 in unmarked $5, $10 and $20 bills, police said.

Eight Years Ago
Aug. 5, 1970

LOS ANGELES — California campus computer centers came under unfamiliar controls as concern grew that the centers were becoming a symbol of the "establishment" to militant groups. This included such measures as moving centers off-campus with a 24-hour guard system and replacing windows with nonbreakable glass.

Reader Commentary

Women Need More Than DP Expertise

The following is an excerpt from a speech given at the National Computer Conference.

By Donnamaie E. White
Special to CW

For the woman DPer who has decided upon management as her objective, upward mobility into the executive suite requires much more than just technical competence. In fact, it rarely if ever depends solely upon technical skills.

It does require that she develop a behavior pattern that may be dramatically different from the one which she has been displaying.

The attitude such a woman needs to develop is one in which she expresses herself as a confident, positive-thinking, aggressive yet not too predatory, success-oriented individual. The behavior pattern should be an emulation of those persons already in the position to which she aspires.

Even better, she should emulate the persons in positions higher than the one she currently seeks.

The behavior pattern includes how she reacts to situations of stress, how she functions in a variety of business situations, including the awkward ones, and even how she dresses.

This advice appears to be rather straightforward and easy enough to follow. However, for the aspiring executive woman, it is definitely not that easy.

While the attention and the reaction to the liberation movement has made access to education and the right to compete for any job a reality for women, it has made no guarantee that a skilled, competent woman will achieve success. It does not guarantee she will achieve the management position for which she strives or that she will be successful once she attains her goals.

The attitudes and the discriminatory practices of those already in charge place formidable barriers in front of any woman attempting the upward climb. This situation is not likely to change for some time to come.

Few Role Models

One of the biggest problems for women DPers is the lack of role models. This affects both the women attempting the upward move into the executive suite and the ones just selecting a career.

Men have their supervisors and executives to use as a reference. Since these are usually men, very few role models are available for women.

Within the computer industry itself, although women have been involved since the very beginning, very few women have made it past middle management. A novice executive woman often finds herself in the difficult role of trailblazer.

There is help available as a result of the rhetoric of the liberation movement. There are a number of "advice books" which have been written by successful women and by special consultants who have studied women executives and who address the problems specific to them.

What is important is that they are accurate and, when properly applied, the methods work.

The books I refer to here should be on the required reading list of any woman who works, whether or not she has consciously made management her goal. I also recommend them to men who wish to understand the problems women face.

Three Books

The first book is *The New Executive Woman* by Marcille Williams. This book approaches the total problem in general terms, dealing with the rules of office etiquette, relationships, office politics and matters of dress. It covers a wide range of topics and does an excellent job of introducing the subject areas of concern.

The second is *The Woman's Dress for Success Book*, written by a John T. Malloy, who has been paid to advise men and corporations in this matter for years. It came about as a result of the need for certain companies to have women in positions of management and the recognition by those firms that something the women were doing was preventing them from being properly perceived as managers, executives or simply as authority figures.

A third book is *Games Mother Never Taught You* by Betty L. Harragan. This book discusses executive gaming and the subtleties in the unwritten rules necessary to know for survival.

Stress on Dress

All of these books emphasize the importance of dress and stress the following basic rules:

- Wear skirted suits. The jacket should be of the blazer type, not form-fitting, with the skirt coming just below the knee in length. Do not follow the rising and falling hemlines of current fashion.
- The fabric should be wool or wool-like or a fabric with the same qualities. It should be as expensive as the woman can afford. The color should be conservative.
- Wear tailored blouses. A man-tailored front-button blouse accented with a scarf is best. Stay away from frills and lace. Until a woman has worked up a personal color scheme, white is the best choice.
- Avoid carrying the masculine

(Continued on Page 28)

The Taylor Report

The Arbitration Clause: Whom Does It Benefit?

By Alan Taylor
Special to CW

One of the growing fashions in computer contracts is the inclusion of an arbitration clause. In its "universal agreement," for example, NCR Corp. includes an especially stringent clause that says:

"Any controversy or claim, including any claim of misrepresentation, arising out of or related to this Agreement and/or any contract hereafter entered into between NCR and Customer, or the breach thereof, or the furnishing of any equipment or service by NCR to Customer, shall be settled by arbitration.

"The arbitration shall be conducted by a single arbitrator under the then current rules of the American Arbitration Association, provided that the arbiter shall be chosen from a panel of persons knowledgeable in business information and data processing systems. The decision and award of the arbiter shall be final and binding and the award so rendered may be entered in any court having jurisdiction thereof.

"The arbitration shall be held and the award shall be deemed to be made in the city where the NCR district office procuring the order is located."

Such clauses are subject for review by both management and DP auditors. The first thing an auditor should do (see "Audits Often Neglect Contracts, Test Decks" [CW, July 10]) is find out whether his corporation even allows arbitration clauses.

DP equipment is now available from enough sources that some firms don't see why their normal corporate policy of preserving contractual rights should be sacrificed for one particular brand of equipment.

The DP auditor should therefore make sure not only that the corporation lawyer has reviewed the contract and that the files contain the review, but that the lawyer has specifically addressed the arbitration clause.

But arbitration is such a unique animal that legal approval of the general contract terms is not enough. This is particularly true when users are faced with a contract, like the NCR one, that is split in half — one part the universal agreement, the second dealing with the equipment or software on order.

In this case, it must be assured that arbitration has been accepted for each grouping of

(Continued on Page 28)

The Human Connection

Halt of DP Sale to USSR Not Appropriate Move

By Jack Stone
Special to CW

The following is a quotation from the July 19 *The Washington Post* lead article entitled "Carter Orders Trade Reprisal Against Soviets":

"President Carter has decided to impose new controls on sales of American ... Technology to the Soviet Union and cancel the controversial Sperry Univac computer sale to Tass, the Soviet news agency ...

"The economic decisions are in reprisal for last week's political trials in the Soviet Union, resulting in prison terms for dissidents Anatoly Scharansky and Alexander Ginsburg ...

"There was no hint yesterday of how much further the Administration intends to go in economic retaliation for the Soviet trials."

After I read the first sentence, I felt I knew the driving force behind this penultimate punishment. There is only one person alive today who can conceive of such exquisite deviltry as depriving an entire nation of its divine right to own a Univac mainframe. — my friend N. Randall Arnesson, the last remaining member of the now-defunct White House Office of Telecommunications Policy (OTP).

Arnesson has had quite an interesting, if not bizarre, background in the information systems business. He seems to have a penchant for being around when orders for the big machines are being canceled or deferred.

Arnesson grew up with IBM, where he was a subluminary on the Stretch and Sage projects, moved to General Electric and played a role in the demise of its computer business, had short tours with Singer and RCA (you know what happened there) and wound up with OTP upon the advice of a headhunter whose history of White House staffing forced him out of business.

Arnesson was radiant, sitting across from me during our luncheon at Clyde's. He hunkered forward and crowed, "Well, Stone, it's been a long time coming. I have reached the pinnacle of my career. For years I've saved society from the ravages of the computer, and were it not for a chance encounter with Hamilton Jordan at Lucky Pierre's, my idea about canceling the Sperry Rand order would never have come to light and the Carter Administration would still be without its first foreign policy suc-

(Continued on Page 28)

Technical Skills Not Enough for Women

(Continued from Poge 27)

theme too far — never wear a tie, even a "pretty" one. Vests may or may not be suitable; if chosen, they must not fit snugly.

- Avoid carrying a purse. Use a dark brown leather attache case instead. Keep the junk cleaned out of it.
- Avoid jewelry. Earrings, dangling bracelets and other distracting items do not belong in an office. The exception is to always wear a wedding ring, even if a woman is single.
- Keep makeup subdued — no false eyelashes, no glittering eyeshadow, no "evening"-style heavy makeup.

Older women, however, should use makeup to disguise their age, especially in terms of hair color. Old age discrimination affects women harder than it affects men.

Women should wear soft, medium-length hair styles. It should not be below shoulder length, nor be too short. It should be serviceable and not sexy.

The reason why I emphasize the importance of dress is that men, technical men such as those found in the hardware side of the computer industry, do not tend to take women seriously. This is especially true when the woman dresses like a schoolgirl, a housewife or a secretary.

Matters of Attitude

In matters of attitude, how to react, what a woman can expect as she moves up the corporate ladder, these books can give some valuable insights. Most important, they can help her understand she is not alone when she encounters discrimination.

When a woman is put down or loses the job she loves and worked so hard to obtain, she should take it in stride, viewing every experience — good or bad — as an educational one. She should never be seen in tears — if she must cry, she should do what Eleanor Roosevelt did: go in the washroom. Righteous anger is a good defense if a woman is trapped; get angry, but do not cry.

When she does make it, she should remember to help other women and men. Most of all, she should set a good example — after all, she will have become someone's role model.

White is monoger of the Educotionol Deportment Systems Applicotions, for Advonced Micro Devices in Sunnyvole, Colif.

Halt of DP Sale Not Appropriate

(Continued from Poe 27)

cess."

"But Arnie, I can't quite follow the connection between the issue of human rights in the Soviet Union and several thousand pounds worth of computing machinery. The Soviet dissidents were involved in free expression of political beliefs. What has that got to do with a Sperry Rand installation in Moscow?"

"Everything, my dear friend, everything! As I advised the President, the computer is ultimately lo be used to publish government-sponsored news releases in a more timely and accurate way than heretofore possible so Tass reporters can get the edge over the news releases of the dissenting citizens.

"Of course, its first five-year plan is expectedly modest; its goal during this period is to automate the name and address file. Now then, don't you see? By canceling the shipment, we have won a major battle for free Soviet speech!

"But wouldn't it have been a lot more effective," I asked, "for Congress and the President to first send a strongly worded joint message to the Soviet government and, if the response were not adequate, then apply sanctions in areas of cooperation that are more relevant to human relations, such as political, educational or cultural projects?"

"That's precisely the response I'd expect from a typical American who is trying to second guess experts like us. Can't you understand the U.S. is not respected for its morality by other nations?

We've got to strike from our strength and hit 'em where it hurts!

"Now that the Russkies are reeling from the loss of the Univac, we still stop the exports of the game cassettes for their home computers.

"If they will don't come to terms, we won't sell'em batteries for their micro-driven abacuses!"

Who Gains From Arbitration?

(Continued from Poge 27)

equipment.

From the auditor's point of view, there is another very important question to address: Have the users been told of the arbitration clause and its implications? This is crucial because arbitration is quick and arbitration is expensive — two factors that argue against its inclusion in computer contracts.

The speed of the arbitration process is often so quick (less than a month or two) that the user really has little time to explore his options — such as a counterclaim against the vendor. In 1988, for example, NCR brought out the Century system, claiming it was the most tested system yet.

In 1970, however, users began to complain of major problems with head crashes, and this was reported in *Computerworld*.

Had NCR contracts included an arbitration clause at that time, the arbitration process would have been so speedy that publicity about the problem might not have arisen, leaving users unable to effectively exercise their contractual rights of counterclaims.

It is generally argued that arbitration is a cheaper way to settle arguments than court cases. From my experience in complex cases, however, there is considerable doubt about whether this is really true for the user.

In arbitration, there is normally only one hearing. In this one-shot deal, the user must present everything; he has no hint about which questions are going to be regarded as important.

By contrast, in litigation, much can be handled ahead of time with such devices as motions and hearings. So arbitration can be more expensive because of the need to be totally prepared at one time.

There is one final matter for DP auditors to consider about arbitration clauses: contingency plans.

Under some clauses, the equipment has to be totally accepted or totally rejected within two to three weeks.

This is generally impractical, so the auditor must review whether it is possible to get new equipment on short notice if the conditions of the clause cannot be met.

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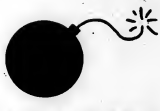
Correction

Tolley of America, Inc. provided the DP malpractice insurance policies described in the June 26 Taylor Report. Tolley can be reached at 3901 N. Meridian St., Indianapolis, Ind. 48208.



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Special to CW

KANSAS CITY, Mo. — When a local distributor of diesel engines, parts and accessories found corporate expansions and relocations were causing its overhead to rise, it decided to fuel several cost savings by establishing its own in-house computer center and implementing a specialized on-line order entry package.

Cummins Mid-America, Inc. selected an NCR Corp. Century 151 mainframe to independently handle such chores as payroll, inventory, accounts payable and receivable and to produce the general ledger. The company also obtained NCR's Sales Processing Interactive Real-Time Inventory Technique (Spirit) software system to aid in the flow of transactions and increase customer services.

Before installing both the hardware and software packages, Cummins had contracted with four separate service bureaus to satisfy its administrative needs. It opted for establishing its own computer center and incorporating the software, however, when it learned that as the number of transactions increased, so did the service bureau's monthly charges.

Inventory availability is displayed on CRT terminal at Cummins Mid-America, Inc.'s main distributorship. The terminal is linked to a CPU controlled by specialized software.

"We wanted to control those costs through the economies of scale which an in-house computer would permit," according to Philip Heath, Cummins' DP director. Now, with the present system, "an increase in the number of order entries processed does not, for example, necessarily mean any increase in computer center costs.

"Already, because we've implemented interactive processing, we're accomplishing more with each data entry input than the service bureaus did. In addition, we now have an open-item accounts receivable system," he noted.

The Spirit software package was modified slightly to accommodate Cummin's four-level pricing system. The "off-the-shelf" system now takes into consideration fleet, wholesale, dealer and interbranch or at-cost transfer prices. This change and others, however, required relatively little effort, Heath claimed.

Cummins Mid-America stocks about 8,000 parts valued at $3.6 million. In a normal work day, the company prints more than 150 invoices, a total of 3,500 a month. Those for parts sold across the counter average three line items, while those for repairs run eight.

The last is an important portion of the company's business, Heath noted, since diesel engines customarily last for 20 years or more. This means they have to be repaired periodically and even rebuilt. Such work can involve a truck engine that may sell new for $3,500 or a generating set which runs to $80,000, excluding accessories.

The information is entered into the computer's disk memory files from one of

(Continued on Page 32)

Programmers Not Around Long? Here's How to Figure Out Why

By L.E. Towner

Special to CW

Retaining DP professionals is an essential requirement of any successful DP organization. It is important that management pursue policies which optimize the retention of skilled personnel.

Programming personnel have a history of changing jobs to improve their status, salary or experience. This turnover occurs on the average of every one and a half to two years. The cost to the organization is very high, both in actual dollars expended and in the loss of project continuity.

Numerous studies have been performed to determine the reason for programmer transience. Few have yielded satisfactory results because conditions vary from organization to organization.

One or more reasons may result in the loss of a programmer, and the key factor tends to vary with the experience and expertise of the individual programmer.

For example, programmers with less than three years of experience change jobs more frequently because of better salary opportunity, poor working conditions, lack of training and lack of state-of-the-art hardware than for other reasons. Programmers with three to six years' experience are more concerned with lack of growth potential, poor working conditions, personality conflicts and just plain boredom with current assignments.

Programmers with more than six years' experience become interested in stability, change jobs with more reluctance and are influenced primarily by poor conditions and personality conflicts. In almost all cases, however, the subjective view of the programmer's situation is more influential

(Continued on Page 31)

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Programmer Retention Rate Can Be Calculated

(Continued from Page 29)

than the reality.

The whole process of retaining programming personnel is frustrating and confusing to the DP manager. It is even more frustrating to non-DP management and personnel department staff who look upon a high turnover rate as a failure of the DP manager.

The incentive to the DP manager to establish and maintain personnel stability is increased in no small measure by the knowledge that his job may depend on personnel retention.

The DP manager with long experience can rely on past knowledge to determine what programs and policies to implement to achieve personnel stability. The recently promoted manager, however, may find out his errors only when people begin to leave. How do we avoid this type of disaster? By determining the optimum retention plan for the individual installation.

Predicting how long a programmer will remain on the payroll can be an educated guess or the result of carefully computed probabilities. For some the guess may be adequate, but the odds can be improved by defining the probabilities of retention based on specific criteria.

From these probabilities the manager can determine, for his individual installation, the optimum retention policies.

A definition is in order here. When the probability of retention is discussed, it means the probability that the programmer will remain for an additional 12 months.

Site and Salary

The first criterion for consideration is the location of the installation. If it is located in a large metropolitan area (500,000-plus population) with significant DP installations (more than 100), the probability of continued programmer retention is lower than for a smaller area. Figure 1 illustrates probabilities of programmer retention in metropolitan areas of varying size.

Salary levels have a marked impact on personnel retention. It is important that the installation salary levels reflect the average of the metropolitan area. If the installation is within 150 miles of a larger metropolitan area, the salary levels of that area must also be considered.

Basically the probabilities of retention defined in Figure 1 are affected across the board by salary level comparability. Figure 2 illustrates the net probability change based on salary levels.

As can be seen, a lower salary level can have disastrous effects on retention, while a significantly higher level does not have corresponding positive effects. This reflects the effect on longevity of other factors which become more important than income after a certain level is reached.

Growth Potential

Growth potential affects retention to an extent only slightly less than salary level. The programmer who feels that there is no room for growth will depart.

The determination of growth potential is a bit more difficult. However, the frequency of salary and performance reviews is viewed as a good barometer of the opportunities for upward movement. The availability of out-of-cycle reviews is an added plus.

Review Period	Change in Retention Probability
0-6 months	+ .25
6-12 months	+ .05
12-18 months	- .10
More Than 18 months	- .25

Add .05 for availability of out-of-cycle reviews

Figure 3. Effect of Salary Performance Review on Retention of Personnel

Figure 3 identifies the effect on the retention probabilities of Figure 1 caused by different review policies.

The remaining conditions affecting retention of personnel are largely subjective and dependent upon the tastes of individual staff members. The only exception is working conditions. The quality and appearance of the working environment will add or subtract up to .10 probability to the Figure 1 levels.

		Probability of Retention in Area With Population:			
Years of Experience	Base Probability	Less Than 100,000	100,000-500,000	500,000-1,000,000	More Than 1,000,000
0-1	.8	.95	.90	.8	.75
1-2	.6	.8	.65	.5	.45
2-4	.4	.75	.5	.4	.35
4-6	.55	.8	.6	.45	.5
6-10	.7	.85	.75	.6	.6
10-up	.85	.9	.8	.65	.65

Figure 1. Probability of Programmer Retention According to Experience and Metropolitan Area Size

Percentage Difference	Change in Rentention Probability	Percentage Difference	Change in Retention Probability
+ 20%	+ .15	- 20%	- .35
+ 15%	+ .15	- 15%	- .30
+ 10%	+ .10	- 10%	- .25
+ 5%	+ .10	- 5%	- .20

Figure 2. Effect of Salary Levels on Personnel Retention

Given all the positive factors, it is possible to exceed a probability of 1. In practice the perfect probability is seldom, if ever, achieved. The maximum probability which any manager should expect is about .95.

The installation achieving above this level is plagued by only one problem: how to select from the volume of applicants who want to work there.

A word of caution: The probabilities discussed here provide a basis for programmer retention policies. They are not intended to define all of the parameters which affect retention.

Personalities will, in many cases, make the final determination of how long programmers stay. The ability to achieve and maintain a homogeneous group of people must provide the basis for using probability as a policy basis.

Module Added to 'Erisa/3' For Social Security Uses

FRAMINGHAM, Mass. — Alpha Systems, Inc. has introduced a software module written in RPG-II to provide the user with a method of calculating Social Security benefits in compliance with legislation enacted by Congress last year.

SSBENS interfaces with the frm's Erisa/3 software but may, with some modification, be utilized with different data structures, a spokesman said.

The module incorporates the indexed earnings system of calculations to process Social Security figures according to national average earnings. It can also compile those figures in the conventional tubular fashion, the spokesman stated.

Both methods of computations will be required at least until 1982, when the indexed version will replace the older table method, he noted.

Printed output from the module consists of an employee earnings worksheet which displays 45 years of earnings history in both modes and also shows all the intermediate calculations leading to either final benefits determination or projected benefits.

The SSBENS module also provides projections which can be used by organizations to compute and apply a Social Security offset to an employee's accrued pension benefit; provide the employee with an "easy to understand" description of expected benefits; and give the employee a statement containing both Social Security and employer-sponsored benefits, Alpha said.

The fee to Erisa/3 licensees for the module is $750, the company said from 1329 Old Worcester Road, Framingham, Mass. 01701.

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Package Fuels Savings for Diesel Distributor

(Continued from Page 29)

the three CRTs in the accounting department. Two of the other CRTs are located in a room where telephone orders are taken, so inventory status inquiries can be made, while a third is located at the parts counter for the same function.

When the accounting department clerks index their CRTs, the computer extends prices and stores the data for the later printing of invoices, which is done at least once and sometimes twice a day. Updated in an interactive fashion are the master accounts receivable records. For the main Kansas City warehouse, inventory records are also depleted.

"Overall, the company has 250 employees, of which 190 or so are mechanics," Heath said. "Right now, the repair department holds work tickets until they are completed, then turns them in for the creation of invoices.

"We plan, however, to implement a work order subsystem which will call for a CRT data entry input each time a part is requisitioned. That way, the inventory records will also be depleted in a real-time context. This will eliminate the 'selling' of a part of which we're temporarily out."

The 96K-byte system has three fixed and three removable magnetic disk packs that put a total of 20 million char. on-line with multiprogramming. The company also has a 300 line/min printer and six CRT terminals with a seventh on order.

Minis a Possibility

Cummins Mid-America has branches in Joplin, Springfield and Nevada, Mo., as well as one in Olathe, Kan. Business is so good at the Joplin and Springfield centers, Heath said, that the firm is thinking of installing NCR minicomputers at each of those locations.

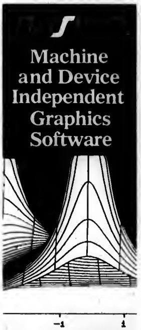
They would then maintain their own inventory records and perhaps even print out invoices, then transmit summaries of the activities to the main computer center for subsequent creation of sales analysis and other management information reports.

Processing for the Nevada and Olathe branches might then be divided between the branch minicomputers and the computer located at the main center, depending on the costs for leased telephone lines and other equipment.

"We are far from having a total system," Heath said, "but the company considers the progress which has been made to date quite significant in terms of cost control. Accounts payable and general ledger have been implemented.

"Next on our agenda is the shop-order subsystem. We're taking things a step at a time, but we're confident that our basic approach — and the computer system — is right.

The important factor is the interactive processing capability provided by our hardware and software — that, plus the fact that we have the upward mobility for any type of growth which may occur in the future," he said.



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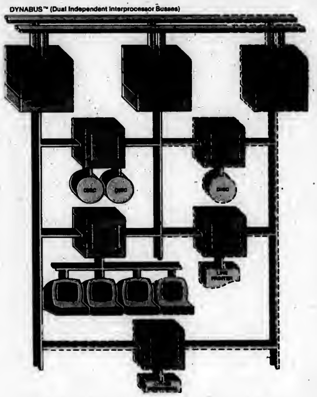

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Data Base Record Management. Extensions have been made to the Tandem FORTRAN READ and WRITE statements to permit the full use of our ENSCRIBE Data Base Record Management facilities. This

Allows 32 Concurrent Users

TAC Has Business Basic for AOS Environments

ATLANTA — Technical Analysis Corp. (TAC) is offering users of Data General Corp.'s Advanced Operating System (AOS) a business-oriented language that reportedly provides an on-line communications path to DG systems for up to 32 concurrent users.

Business Basic/AOS runs on any mapped or unmapped DG system with at least 64K bytes of core and the firm's standard multiplexers, a TAC spokesman said. The software allows the user to simultaneously program, test, debug and execute completely independent programs interactively without concern about the activities of other users, he claimed.

Statements entered through the system are analyzed for syntactical errors by the software and can be changed, retried and later stored on disk or magnetic tape, the spokesman continued.

The system incorporates file structures to facilitate data access capabilities and minimize disk space. An indexed sequential technique also allows access to more than 15 million records with only four disk seeks, TAC said.

This particular facility permits multiple indexes to the same data file as well as indexes independent of a data file.

The system also features double-integer (32-bit) arithmetic variables to ensure commercial accuracy; file maintenance, sorting and utility programs; and text editing and justification routines which may be used with upper/lower case terminals for document preparation.

A user system call function allows programmers to perform functions normally requiring Assembly language subroutines, the spokesman added.

Business Basic/AOS sells for $4,000, including a one-week programmer's training class, from TAC at 120 W. Wieuca Road N.E., Atlanta, Ga. 30342.

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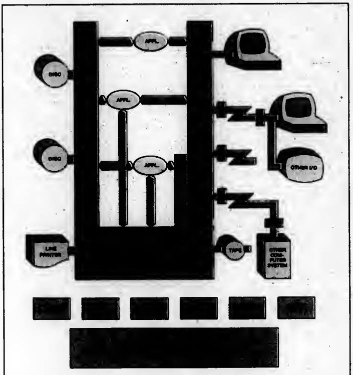

The unique interaction between Tandem NonStop Hardware and Software makes the multiple processor system easy to use and easy to expand.

makes it possible to access key-sequenced, relative and entry-sequenced files by primary or up to 255 alternate keys. Provisions have been made to allow exact, approximate or generic positioning into an ENSCRIBE file structure using FORTRAN. Concurrent data base access with other programs and languages is supported with LOCK mechanisms at either the record or file level.

Interprocess Communications. Tandem FORTRAN processes can communicate with one another or with processes written in other languages through standard FORTRAN READ and WRITE statements. Communication to other processes is implemented using the interprocess communication facilities of the Guardian Operating System.

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For further information, contact Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, California 95014; Frankfurt, West Germany; Uxbridge, England; Toronto, Canada.
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TANDEM

Abacus Puts Data Off-Site

CLEVELAND, Wis. — The Abacus Research & Design Group will provide off-site storage for source programs, proprietary data bases or any other type of machine-readable data requiring specialized storage protection.

The firm's data repository service stores a user's information at one of three different sites, providing a backup alternative in case of documentation loss, a spokesman said.

The service can also be utilized to protect software documentation a user might need in case of vendor support failure.

Fees for the service are based on the size of the file, duration of storage and frequency of retrieval. Special rates are charged for file modifications and for long-term storage of seldom referenced files.

Files can be shipped within four hours of a user's request and in the user's hands within six to 24 hours, depending on distance and airport connections, the firm claimed.

Users are charged an initial fee of $25 to cover setup and an additional monthly fee of 10 cents per 100 bytes of data. A modification of files costs $25; fees for file retrieval range from $25 to $100.

Abacus is located at P.O. Box 247, 944 E. Washington Ave., Cleveland, Wis. 53015.

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Program

Conference Chairman: Herb Grosch, President of the ACM (USA)

Monday 11 September

1 **Market factors and technological change** Ulric Weil, Morgan Stanley (USA)

New IBM products, and IBM's marketing strategy, will be determined by what is wanted by users and what is technically and economically feasible. This session examines the changing application requirements of existing and prospective users, evaluates future trends in the costs and performance of current and forthcoming technologies, and diagnoses the economic health of IBM and its competitors in the near future.

2 **System 370 and beyond** Bill O'Connell, Amdahl Corp (USA)

The 303X series is an end-of-life 'kicker' for the 370 architecture, its low purchase-to-lease cost ratio indicates that IBM wants customers to buy rather than lease — and that's always a sign of impending obsolescence. What will the new E and H series look like, and when will they be announced? This presentation investigates IBM's short and medium term plans for new mainframe announcements, and assesses their impact on users and competitors.

3 **Future IBM peripheral systems** Dan O'Brien, Memorex (USA)

Peripheral systems account for an increasing proportion of hardware costs. What new storage and I/O devices will IBM introduce, and how will they be packaged in relation to processor hardware and software? This presentation examines new and established technologies, assesses their future commercial significance, and predicts how they will be incorporated in IBM's new range of peripheral systems.

4 **IBM's global strategy** Howard Anderson, The Yankee Group (USA)

IBM's strength is centred on the mainframe market, so IBM has a powerful incentive to protect the mainframe. The major threat comes from distributed processing, and IBM's counterattack hinges on eliminating the main rationale for distributed processing by drastically cutting the cost of communications. This presentation outlines IBM's subtle strategy for achieving this objective both directly through SBS and indirectly through pressure on the common carriers in the USA.

Tuesday 12 September

5 **System software — IBM's plans** Dick Beyles, National CSS (USA)

Two distinct trends are apparent in IBM's software strategy: the first is the extension of unbundling into system software, and the second is the migration of system functions from software into firmware or even hardware. What effect will these trends have on future IBM architectures, and how will they affect suppliers of IBM compatible software and hardware?

6 **IBM's database plans** Stephen Robinson, Consultant (USA)

Committed to IMS, but with a strong internal faction in favour of the relational approach, it nevertheless seems possible that IBM is about to adopt a database architecture based on the ANSI and CODASYL proposals. Such an architecture could well be implemented using a new 'back end' database machine. What will IBM's strategy actually be?

7 **IBM and the plug-compatible suppliers**
Bill Easterbrook, Kidder Peabody & Co (USA)

Ever since unbundling, IBM has been plagued by fierce competition in narrow areas of its product range. The plug compatible suppliers of peripherals and mainframes benefit from the standard interfaces developed by IBM. IBM can damage the plug compatibles by changing those interfaces, but only at a significant cost to itself. IBM also has a powerful battery of economic weapons at its disposal. What are IBM's options, and how will the plug compatibles respond?

8 **IBM's shifting revenue sources** Phil Dorn, Dorn Consultants (USA)

Data Processing Division (DPD) is the heart of IBM, and DPD is intent on rejuvenating the mainframe market. But Office Products and General Systems Divisions (OPD and GSD), which will shortly merge, are into new markets with new and rich prospects (and new problems, too). This presentation shows how IBM's centre of gravity is slowly shifting, and explores the consequences both for IBM and for the rest of the DP community.

Wednesday 13 September

9 **IBM's plans — networking and data communications**
Howard Frank, Network Analysis Corporation (USA)

IBM was later than most other manufacturers in recognizing the close connection between computing and communications, but there is no doubt that networking and data communications are now central to IBM's future plans. How will current IBM networking concepts (in particular SNA) be extended or modified in the future, and what new developments can be expected? How will IBM incorporate satellite communications and other new communications technologies into its future product line?

10 **IBM in Europe** David Butler, Butler Cox & Partners (UK)

Like most giant American owned multinationals, IBM's relations with European national governments and the European Economic Community are often strained, and IBM's attempts to trespass on the territory of the telecommunications authorities are likely to cause further confrontations. What are the political issues involved, and what will be the technical and commercial consequences for IBM's European users and competitors?

11 **IBM — The user's view** Alan Duncan, Barclays Bank (UK)

New IBM products are only one of the existing IBM user's worries. Perhaps more important, over the next five years, are such considerations as support, pricing policy, maintenance, and IBM's general business practices. In this session these and other factors of significance to the IBM user are analysed, and possible changes in the relationship between IBM and its users are forecast.

12 **Forum**

An open discussion session at which speakers answer questions from the floor and elaborate on points raised during the Conference, while delegates contribute their own experience and expertise to the discussion.

Set to Start This Year

Japan Packet Net to Woo World Users

By Ronald A. Frank
CW Staff

NEWTON, Mass. — One of the most comprehensive international packet networks will begin operating in Japan later this year. The network is called Venus, which stands for Valuable and Efficient Network Utility Service, according to Kokusai Denshin Denwa (KDD), the Japanese international record carrier.

Venus was designed to provide the primary link for Japanese data communications users who want to access international packet nets. It will also allow foreign users to access Japanese services.

Venus will interface directly with the Digital Data Exchange (DDX), the public data network of Nippon Telephone and Telegraph.

According to specifications drawn up by KDD's data communications department, Venus will offer five classes of service, although only one — Class T — will be offered initially. Class T will accommodate time-sharing and data base customers; it will utilize an Isis network node provided by Tymnet, Inc., the U.S. packet network carrier.

Class T will begin this year with an "interim system" providing speeds for start/stop terminals at 300- and 1,200 bit/sec. This will be supplemented "after 1980" with a full system that will add synchronous terminal support at transmission speeds of 2,400-, 4,800- and 9,600 bit/sec. Access will be via public dial-up or subscriber tie lines, according to KDD specifications.

Other Offerings

The Venus timetable calls for a second offering, Class R, to be introduced in early 1979 for "real-time traffic" to serve data and facsimile users. Class R service will provide an interface with DDX and also provide access via subscriber tie lines.

The service will provide abbreviated address, reverse charging and direct call capabilities at synchronous speeds of 2,400-, 4,800- and 9,600 bit/sec. Support for 48K bit/sec is under consideration, according to the KDD documents.

In January 1980, plans call for the addition of Class M, a message-switching service that will include store-and-forward capabilities. This will include start/stop support at 1,200 bit/sec and synchronous support at 2,400-, 4,800- and 9,600 bit/sec.

Class M will allow the use of mnemonic addresses, multiaddressing, priority messages, message retrieval and "redirection" and code conversion. Access for Class M customers will be via subscriber tie lines.

Two additional service levels will be offered after 1980, probably by 1982. Class F will provide facsimile with store-and-forward and code conversion capabilities at synchronous 4,800- and 9,600 bit/sec speeds; 48K bit/sec is also under consideration for this offering. A direct call feature may also be added to the service.

The fifth service, Class D, will serve special customer groups such as airlines. The functions available under Class D will be both start/stop and synchronous capabilities as requested by users, the KDD documents said.

Compatible With X.25

The Venus packet terminal interface will be compatible with the CCITT X.25 standard and include up to 255 logical channels. The interface will offer complete bit transparency and the length of the maximum data field will be 128 octets, according to KDD.

Permanent virtual call and closed user group capabilities are being considered for Venus, but will not be offered initially. It is expected that the service will implement the X.121 international numbering scheme recently adopted by the CCITT.

Although not yet complete, it is expected that Venus will interconnect with Telenet, Datapac, Transpac, the Japanese DDX net scheduled for 1979 introduction and AT&T's recently announced Advanced Communications Service (ACS).

American international record carriers are currently negotiating with KDD to offer the Venus service in the U.S. It is probable that either ITT or RCA will offer the service to users in this country, observers believe.

ACS Under Study

NEW YORK — The impact of AT&T's recently announced Advanced Communications Service (ACS) will be discussed during a two-day symposium here Aug. 15-16.

Sponsored by The Yankee Group, the meeting will be held at the Harvard Club.

Registration for the symposium is $550. Details are available from The Yankee Group, Box 43, Cambridge, Mass. 02138.

Independence Up Front — Part 1

IBM User Prepares for Big Net By Picking Non-IBM Front End

Special to CW

SAN FRANCISCO — An independent front-end communications processor is helping Levi Strauss & Co. upgrade its corporate communications network.

The apparel maker's DP center here, which uses an IBM 370/158 and 370/168, forms the hub of a network that provides links with four major distribution centers — in Florence, Ky., Little Rock, Ark., Amarillo, Texas, and Henderson, Nev. Each of these centers has an IBM 370/145.

In addition to these sites, the firm's corporate network eventually will connect 70 domestic locations and 40 foreign plants.

"Production and distribution are key factors in our industry. We need to have the latest fashions on retailers' shelves to meet consumer demands. To accomplish this, we decided upon a centralized system that would help shorten the time between ordering and delivery," according to Joseph Reuss, Levi's corporate director of telecommunications.

In 1972, Levi installed its first data communications network, a batch-oriented system for remote telecommunications. That was replaced last year with a Computer Communications, Inc. (CCI) CC-80 communications processor with network communications system (NCS) software.

"Our first system was adequate for our needs at the time. However, it was not user-interactive, it did not provide us with network control and it did not have the capability of centralized diagnostics and control," Reuss recalled. "Also, it would not enable us to use future data communications media, such as satellite transmission."

A large IBM user that decided it needed a front-end communications processor describes the selection criteria it decided upon after a year-long study. Next week, in the second half of this series, the user describes how the processor operates in an extensive network.

Before evaluating and selecting a system, Levi's Telecommunications Group spent a year defining the type of system that would be required.

"We not only wanted a more efficient system to handle our current needs," Reuss explained, "we also wanted a system that would carry us into the 1980s. We saw the need for expanded communications when our European distribution centers opened in the early 1970s. And we recognized that a

(Continued on Page 36)

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PDP-11 Gets X.25 Link to Telenet

WASHINGTON, D.C. — Telenet Communications Corp. has announced an X.25 standard interface linking Digital Equipment Corp. PDP-11 minicomputer systems running RSX-11M software to the Telenet packet network.

The X.25 software package will be provided by Telenet under a licensing arangement with its developer, Computer Corp. of America. It will be available next month, according to the firm.

The X.25 interface is said to offer users of Telenet's packet network the advantages of faster response time and lower communications costs. No modifications to the user's operating system software or application software are necessary, according to a spokesman.

The PDP-11 interface supports asynchronous terminals at speeds up to 1,200 bit/sec. It can also be configured to permit computer-to-computer communications at speeds up to 9,600 bit/sec.

The RSX-11M/X.25 package allows the PDP-11 host to initiate remote connections. In conjunction with read-all and write-all functions, the package can be configured to allow host-to-host communications.

The software allows the use of X.25 in a remote concentrator environment. Multiple physical lines are supported to ensure that redundancy is available on the communications link, Telenet said.

The software operates as a loadable driver under RSX-11M Version 3. Dynamic memory allocation is used to buffer.

The minimum system required to run the software is a PDP-11 with 4K words utilizing the X.25 protocol with character framing and Ascii control characters.

The PDP-11 package will be offered by Telenet for a one-time installation and licensing fee of $1,500 and a monthly charge of $500, which includes software maintenance and program updates.

Telenet is at 8330 Old Courthouse Road, Vienna, Va. 22180.

IBM User Takes A Year to Study Front-End Need

(Continued from Page 35)

worldwide data acquisition and processing network would be needed to meet the company's long-range growth objectives.".

Eight Criteria

The criteria that Levi's developed for its data communications system included:

- Universal terminal compatibility. The system had to interact with any type of terminal such as CRT, printer or teletypewriter or another CPU. This would allow Levi to select terminals based on performance, not compatibility. Also, the system had to communicate with any CPU added to the system, IBM or not.
- High throughput rate to mainframe channels. An intelligent front-end processor was required that would keep pace with any mainframe in terms of cycle and operating times.
- Software control for multiple communications applications. Since each CPU at Levi has its own telecommunications protocol, routing and control had to be dynamically handled by the processor without the need for a complex system of subchannel addresses.
- Real-time diagnostics. This was an important point with Levi. The firm wanted centralized control. If a terminal malfunctioned, it wanted to be able to take it off-line to free the channel and to diagnose the cause of the failure. Also desired was a record for long-term network analysis.
- Network link independent control. A network in which each node is independently controlled would give the user a more efficient system.
- Routing capability. The front-end processor had to be capable of taking a specific data base and routing it to a specific point within the network without using valuable mainframe time.
- Multiple communications media. The system would need to be able to operate with newer media, including satellite transmission.
- Integrated communications. Levi's goal was a system that could handle all its communications, including word processing, remote job entry, voice communications and message switching.

The system Levi selected is now handling all data transmission and data collection between Levi's headquarters and its four distribution centers. One CC-80 is installed in San Francisco and provides network control; a second CC-80 is installed in Amarillo.

Eventually all the distribution centers will have CC-80s. This will result in a totally interactive network, Reuss said.

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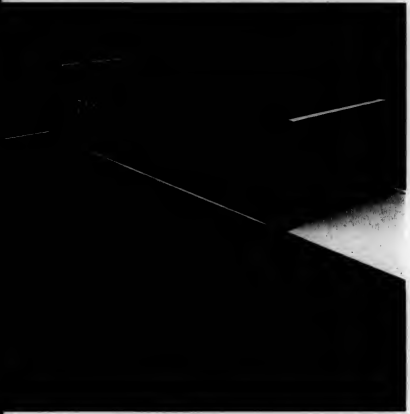

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Modems Have FCC Approval

U.S. Robotics Adds Coupler, Two Data Sets

CHICAGO — An originate-only acoustic coupler and two modems certified by the Federal Communications Commission (FCC) have joined U.S. Robotics, Inc.'s USR-300 series of asynchronous half- and full-duplex products.

The USR-310 acoustic coupler permits access to remote, on-line computer installations via any standard telephone.

The stand-alone unit can reportedly be linked to a host CPU by insertion of the telephone handset into rubber cups on top of the unit after the CPU's telephone number is dialed and an answer tone is received.

FCC-certified versions of the USR-320 and USR-330 modems — previously available for use with phone company-provided Data Access Arrangements (DAA) — are now available for direct connection to the telephone network.

The phone line connection is via the standard jack used on most current telephones, U.S. Robotics said, noting no special data equipment need be leased from the phone company.

The USR-320 auto-answer modem can automatically handle incoming calls, placing off-site users in contact with the host CPU, the firm said. Terminals, printers and any other data transmission equipment conforming to EIA standard RS-232C or 20mA current-loop interfaces can also be connected to phone lines via the USR-320.

The USR-330 features front-panel switching between manual-originate and auto-answer operation.

The coupler and modems transmit data at speeds up to 300 bit/sec. The USR-310, FCC-certified USR-320 and USR-330 cost $139, $299 and $324, respectively, the firm said from P.O. Box 5502, Chicago, Ill. 60680.

Worldcom To Cut Rates

NEW YORK — ITT World Communications, Inc. (ITT Worldcom) has filed proposed rate reductions of up to 25% for Telex and private-line services with the Federal Communications Commission (FCC).

The proposed tariff reductions represent "flowthrough" of satellite rate reductions which ITT Worldcom will receive as the result of the settlement of an FCC investigation.

Under the tariff, all current rates for Telex calls from the U.S. and Hawaii of $4/min will be reduced to $3/min. The present $3/min rates in operation for Europe, Africa, Middle-Eastern countries, South America and Central America will be reduced to $2.75/min.

From Puerto Rico and the Virgin Islands, Telex rates currently at $5/min will be reduced to $4 and current $4 rates will be reduced to $3.

Voice-grade private-line rates from East Coast gateway cities of the U.S. to Europe, presently $4,545/mo, will be reduced to $4,225/mo.

Rates for voice-grade private-line channels to South and Central America, which are currently charged at varying monthly rates according to the country, will be reduced to $4,460/mo, the company said.

From the gateway city of San Francisco to countries in the Far East, voice-grade private-line channel rates will be reduced from $7,900/mo to $6,000.

From Hawaii to Australia, the monthly rate will drop from $5,100 to $3,975 monthly.

ITT Worldcom is at 67 Broad St., New York, N.Y. 10004.

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Quick Lanes Mean More Profits

System Matches Customers, Checkouts

By Michael D. McGee
Special to CW

WAUWATOSA, Wis. — An article of faith in the supermarket industry is that fast checkout service keeps shoppers coming back and influences store profitability. However, if the number of customers waiting and the number of lanes open are mismatched, productivity declines and labor costs escalate.

Pick N' Save Warehouse stores, a chain of warehouse-type supermarkets owned by Roundy's, Inc., has met the scheduling challenge with the help of a supermarket scanning system. The scanners, which are connected to our IBM 370/135 at Roundy's headquarters here, have improved our front-end operations significantly since we installed the system two years ago.

Among the benefits we have realized are the following:

- Sales per man-hour for front-end personnel have increased an average of 23% for the five stores on the system.
- The average number of customers waiting to check out has been reduced.
- Checker productivity, measured in terms of checkout item counts per hour, is up by 17%.
- The time required for scheduling front-end personnel has been reduced by at least two-thirds, and scheduling is now done by chief cashiers, not store managers.

Advantages for Everyone

The use of the system — which reads the Universal Product Code printed on each item, looks up the price and description of the item and displays these to the customer while printing them on a tape — has been advantageous both to us and our customers.

For our customers, the advantages are obvious: faster checkout, fewer wrong rings and a detailed register receipt that gives a clear record of purchases. In addition, the system, an IBM 3660, speeds customer check authorization and simplifies food stamp item identification.

To our advantage, the system captures sales by item and by department. Secondly, the system gives us a record of the number of regular and express checkout lanes during each 15-minute period and also records checker productivity within these periods.

The information captured by the system is available to store management via a terminal and is retrieved from the on-site controller (where it is batched during the day) for further analysis at headquarters after the stores close.

The checkout and scanning advantages of the system alone more than justify its installation. However, the benefits have multiplied since we implemented a second element of the IBM supermarket system, the Cashier Assignment System (CAS).

This CAS, available as a field-developed program from IBM, enables us to put the information captured by the scanners to its best possible use in balancing customer service and store labor costs.

Productivity Up 17%

CAS was incorporated into the system at the five stores late last year, and the payout — in terms of customer service, sales per man-hour and checker productivity — was big and immediate. For example, within weeks after we began posting CAS checker performance charts at the store, average checker productivity rose by 8%.

As store personnel learned how to use CAS checkout requirement forecasts as a basis for front-end scheduling, average checker productivity rose another 9%.

Virtually all the data required by CAS comes from the checkout scanning routine. The only data not captured automatically by the system is the customer queue count; this is entered into the terminal by the checker, who counts the number of customers in line after every checkout is completed — an operation requiring about one second.

The data read from the on-site controllers is used to produce a set of weekly reports that we find exceptionally helpful. The first of these is the "Store Activity Profile," which details the activity by store for each 15-minute segment of the day.

This tells us the number of lanes open during each segment (regular and express), the number of office terminals manned, the average queue length and the maximum queue length per lane per time segment.

Using the data from this report, we can pinpoint service bottlenecks by day and by time of day; conversely, we can pinpoint excessive numbers of open checkout lanes when the number is not warranted by the

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FM an Easy Bill to Swallow: Hospital Saves Annual $30,000

By Howard A. Karten
CW Staff

NEWTON, Mass — Replacing a shared computing service with an in-house facility owned and operated by a facilities management (FM) firm proved to be just what the doctor ordered for a hospital here.

Not only did the move cure many of the growing pains the hospital was experiencing, but it is saving an estimated $30,000/year in the process.

One year ago, Newton-Wellesley Hospital began to consider alternatives to the DP service it was then sharing with other hospitals. Although that service had been satisfactory, the growing load of outpatient services was straining the hospital's billing procedures.

"With the service bureau, for example, our inpatient/outpatient trial balance could only reflect the last five transactions per patient. But now we have a complete history on all patient transactions, which is vital in answering questions regarding billing," according to Kevin McManus, the hospital's director of fiscal services.

The nonprofit teaching hospital, which is affiliated with Tufts-New England Medical Center, considered several alternatives: other shared services, its own DP operation, facilities management (FM). It decided upon using the Keamed Division of Keane Associates, Inc. to provide the entire service.

"What we were looking for was a product coming out the door; how that product is manufactured doesn't concern me. I want experts making the decision of which equipment is the best to manufacture the product I want," McManus said.

To provide that service, Keamed installed an IBM System/3 Model 15 at the hospital and staffed the installation with its own operators and programmers. The 64K system is complemented by an IBM 3410 and an IBM 3411 tape drive, a Model 3340 disk and a printer and reader/punch.

Software for the system was also supplied by Keamed. Written in RPG-II, it is used by "about 20" other hospital installations also managed by the Boston-based consulting company.

Advantages of RPG

The advantages of having an RPG system are twofold, according to Bob Cohen, Keamed manager. First, all major computer manufacturers support the language, so Keamed is not limited to any one vendor for hardware.

Secondly, the basic system sold by Keamed contains general features and information; the information and formatting needed by specific users can be easily and quickly tailored , he said.

"Each of our users has a different personality, and we can tailor the operation to fit that personality," he observed.

(Continued on Page 41)

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From OCR to Coolers

Literature Available to Users

Several sources have announced literature of interest to users:

• The "OCR-A Fact Pack" is available free from Monarch Marking Systems, Inc. The Fact Pack contains information and specifications related to Monarch's marking systems and supplies; it includes a pamphlet on selecting an OCR-A marking system and supplier. The Fact Pack is available from Monarch at Department OCR, P.O. Box 608, Dayton, Ohio 45401.

• *Electronics Dictionary*, Fourth Edition, from McGraw-Hill Co., contains more than 17,000 definitions of electronics words and terms, according to the publisher, including 3,400 entries for new terms just beginning to appear in the literature.

A new section of the work, the "Electronics Style Manual," is said to be useful for resolving questions of style in usage and for spotlighting troublesome spellings and writing problems encountered by electronics engineers.

The reference work was written by John Markus, who has authored or edited numerous books in the electronics field; it costs $24.50 from McGraw Hill at 1221 Sixth Ave., New York, N.Y. 10020.

• The current issue of the Auerbach "Reporter," published monthly by Auerbach Publishers, Inc., contains an article on "Evolution of System Architecture."

The publication, which is available free to subscribers of any of the Auerbach Computer Technology Reports, examines trends in the system architecture of the major classifications of computer hardware, according to the company, with particular emphasis on the role of large-scale integration (LSI).

The article traces the path that has been taken in hardware design since the 1940s and concludes with a discussion of evolution in computer design.

The predominant trend in design, the article concludes, will be toward making even the most revolutionary hardware changes appear evolutionary to the user. Auerbach is located at 6560 N. Park Drive, Pennsauken, N.J. 08109.

• Diablo Systems, Inc., a supplier of disks and matrix printers, is offering a booklet entitled "Twenty-Five Ways to Improve Print Quality."

The booklet, which is aimed at users of daisy wheel printers, suggests that the use of the right ribbon, the correct print wheel and the correct type of paper will improve the print quality of work produced with the device.

Suggestions are also offered on the care of printer components and other factors of equipment and materials that affect print quality.

The booklet is available free from the company at Department B-101, 24500 Industrial Blvd., Hayward, Calif. 94545.

FM Easy Bill To Swallow

(Continued from Page 39)

Two other advantages of using an FM approach are flexibility and responsiveness, according to McManus. "The ability to get an individualized product was the chief reason for going to Keamed," he noted, adding that the shared service previously used was unable to provide customized processing, since the same program was shared by all the hospitals.

Now, however, the hospital is not charged for customizing or for special programs or requests.

"To date, we've been able to give the hospital back whatever it's asked for and meet all its demands, almost within a day or two," Cohen said. This service is provided without additional cost to the hospital, he explained, since the costs of providing the service can be amortized over all Keamed's customers.

Reason for Response

Part of the reason for this ability to respond rapidly to the hospital's requests lies in the fact that the equipment is on-site; this, too, was one of the reasons for choosing this option. "Because Keamed would maintain both equipment and staff on the premises, it would always be available for interaction with hospital management," McManus noted.

"The activities are all there now for the hospital to see, and there's no problem in responsiveness," Cohen added. "The hospital can now say, 'We want this Monday,' and it gets it on Monday. It determines its own schedule; with a shared environment, you could always find a reason not to change a program.

Parallel Interface Links Diablo Model 2300

HAYWARD, Calif. — Diablo Systems, Inc. is offering a buffered parallel interface for use with its Model 2300 matrix printer or any host system that has a parallel interface.

The interface permits data to be transferred to the Model 2300 matrix printer at speeds up to 500,000 byte/sec in a parallel mode — up to 25 times faster than previously possible, a spokesman claimed.

The interface includes a 256-byte buffer designed to increase the print storage capabilities of the Model 2300, thereby lowering the number of printer control transactions required by the host system, the spokesman explained.

The Model 304025-01 buffered parallel interface is a follow-on to three previous interfaces offered by Diablo, including the company's standard 2300 interface, an RS-232 interface and a current-loop interface that allows use of the 2300 matrix printer in remote print station applications.

The buffered parallel interface can be inserted in the card cage of any installed Model 2300 matrix printer. It can also be ordered with new purchases, the spokesman noted.

The interface costs $105. Diablo is at 24500 Industrial Blvd., Hayward, Calif. 94545.

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Axiom Adds Nonimpact Line Printer Options

GLENDALE, Calif. — Axiom Corp. has added three versions of its EX-801 intelligent electrosensitive line printer, introduced earlier this year.

The three nonimpact printers, designated the EX-801S, the EX-801P and the EX-801HS operate at 160 char./sec, according to the company, and can print 80, 40 or 20 columns on 5-in.-wide electrosensitive (aluminized) paper with a choice of three character sizes.

The difference between the printers lies in the interfaces, which are parallel Ascii, serial input to 1,200 bit/sec (RS-232/20mA interface) and serial input to 9,600 bit/sec, respectively.

Designed around the Intel Corp. 8048 microprocessor, the EX-801 printers feature a 256-character, multiline asynchronous input buffer expandable to 2,000 characters; a 96-character Ascii set expandable to 256 characters with user-programmable fonts; and an optional 2K bytes of user-programmable read-only memory (ROM) that can convert the EX-801 into an intelligent printer.

The user program in the ROM can call on subroutine blocks in the basic software package stored in the 8048 so input data can be automatically formatted to user specifications, a spokesman explained.

Each of the printers is a complete stand-alone unit that includes case, power supply, interface, character generator, low paper detector, bell, built-in self tester and paper roll holder.

The prices for the printers are $395 for the EX-801P, $495 for the EX-801S and $549 for the EX-801HS. OEM discounts are available.

Axiom is at 5932 San Fernando Road, Glendale, Calif. 91201.

System Cuts Checker Time

(Continued from Page 39)

traffic. In short, we can get a flx on how well or how poorly we are balancing customer service against personnel costs.

Supplementing this report is a weekly summary of sales and hours, which details by store, the sales in units and dollars of regular and express lanes. Also included in this report are the number of customers served, total number of items and active cashier hours.

Other CAS reports, equally valuable, provide a clear picture of performance by individual store cashier. Essentially cashier productivity reports, these are produced in three separate versions: a performance profile showing the average number of item/hour throughput per cashier within five order size groups; a cashier selection summary, ranking each checker in descending order with store counterparts in terms of throughput; and a graph showing each checker's ranking by productivity percentage within each of five order size groupings.

The graphs are posed each week by the store manager to try to motivate productivity by the cashiers.

CAS' final output is the "Checkout Requirements" report. Using information on the store's past history, weekly sales volume and special considerations, such as planned store promotions, the system predicts customer counts and item volumes by time segment.

This information is used to forecast the number of checkers that will be required at different times; thus, the weekly personnel schedule can be set up in a much shorter time, stay more stable and be more responsive to actual customer traffic and item purchase patterns.

McGee is manager of retail operations for Roundy's, Inc.

Calcomp Plotter Work in T/S

ANAHEIM, Calif. — California Computer Products, Inc. has unveiled a high-speed, microprocessor-based plotter designed for remote or time-sharing applications.

Capable of operating at speeds up to 10 in./sec, the Calcomp Model 1012 drum plotter is a desktop unit with a resolution of .05mm that uses 11-in.-wide Z-fold paper, according to a spokesman. It is equipped with an integral RS-232C controller that allows direct connection to host computers and includes a 256-byte input buffer as standard equipment, he added.

Other features of the system include four pens, switch-selectable transmission rates from 110- to 9,600 bit/sec, a 96-character print set and a Y-axis limit switch.

The Model 1012 costs $6,500, Calcomp said from 2411 W. La Palma Ave., Anaheim, Calif. 92801.

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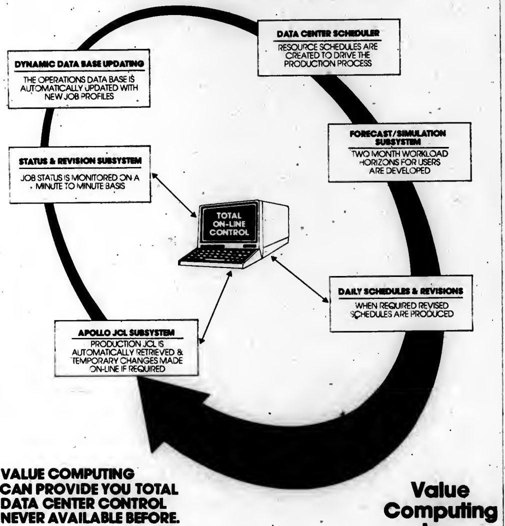
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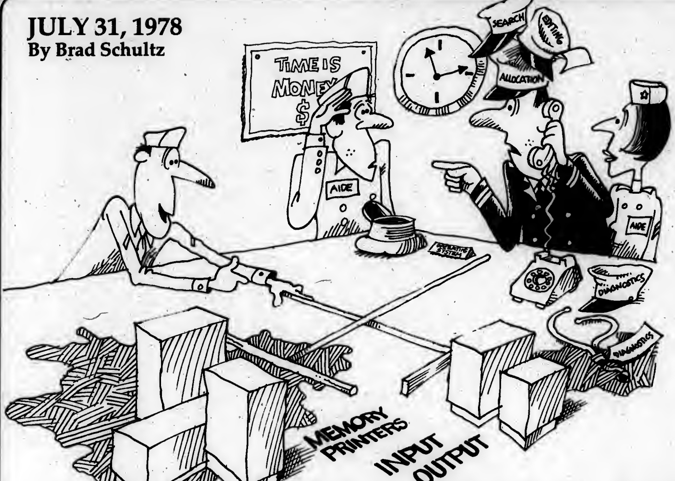
Computerworld Special Report

JULY 31, 1978

By Brad Schultz



SYSTEMS AND UTILITY SOFTWARE

For File Update, Retrieval

Data Management Systems Simplify Coding

The author sees Data Management Systems (DMS) as "software tools designed to facilitate file maintenance, information retrieval and/or report generation functions." In the following discussion, he distinguishes between DMS and Data Base *Management Systems, suggests what is desirable in DMS and indicates how to define user DMS needs.*

By Herbert Gepner
Special to CW

The most common DP tasks deal with the maintenance and retrieval of file information within the applications processing environment. These functions include the creation, updating and retrieval of specific types of data from user files, the manipulation and formatting of this information and the production of reports or subfiles from the accumulated data.

Although the specific applications differ widely from company to company, the above-mentioned tasks are, for the most part, performed in basically the same manner. In response to the resulting market opportunity, software vendors have developed a class of software commonly called "data management systems" (DMS).

The main purpose of such software is to free the user from the need to develop detailed programs to handle these common tasks and, at the same time, to offer the user a product which is easily adaptable to his specific requirements.

DMS should be carefully distinguished from *data base management systems* (DBMS). The unfortunate similarity in terminology tends to mask significant differences in the functions and purposes of these two important types of software systems.

This article is excerpted from "A Buyer's Guide to Data Management Systems," a Datapro Research Corp. special report.

A DMS can be defined as a system intended primarily to permit access to, and retrieval of data from, already existing files (usually for a *single application).* Although a data management system may provide the capability to reduce data redundancy and centralize the storage of data, the principal intent of the system is to perform such functions as information retrieval, report generation and inquiry processing for individual applications.

A DBMS, on the other hand, can be defined as a software system intended to manage and maintain data in a nonredundant structure for the purpose of being processed by *multiple applications.* A DBMS organizes data elements in some predefined structure and retains relationships between different data elements within the data base.

For years, programmers have been using such programming languages as Cobol, Fortran, PL/1 and the various assembly languages to tell the computer exactly what to do and how to do it. With a DMS, the user seeks to minimize the need to perform detailed programming functions.

The system does this by asking only

(Continued on Page S/6)

At Data Centers Worldwide

Manufacturer Fends Off Performance Woes

Special to CW

BUCHANAN, Mich. — Performance problems don't suddenly sneak up on you — they build up until they've backed data center management up against the wall. When that happens, it generally results in a rush to purchase bigger or additional hardware.

Data center management at Clark Equipment Co.'s headquarters here knows the feeling and doesn't want to be put into the position again. At least, not if it can do anything about it. To ensure it won't happen again, management has taken steps to establish a performance management program that can be used at all of the firm's data center sites around the world.

More than a year ago, this company's corporate data center was operating an IBM 370/145 under OS/VS1. During the day shifts, it was processing IBM's CICS and batch, and on the second and third shifts it was processing batch only. CICS response time had deteriorated to an average of 17 seconds. It was apparent that improved service was needed and that action had to be taken immediately.

"We knew that our poor throughput performance was the result of a number of problems such as excessive paging, poor channel utilization and similar system problems," according to Joe Leisher, technical services manager. "We also knew that because of increasing requirements we would need a larger CPU."

Because of this, the group carried out a justification program for an IBM 370/148. Fortunately, one was available and was quickly installed at the data center.

Precautionary Measures

Once the crash project was completed, data center management wanted to ensure that the organization would never again be put in a similar situation. Company officials visited a number of similar-sized data centers to see how they monitored and measured their system performance and managed their constantly changing environments.

As a result of the research, the company established an extensive computer performance measurement program which included the purchase of Boole & Babbage, Inc.'s Configuration Utilization Evaluator/Data Set Optimizer (CUE/DSO), Total System Analyzer (TSA) and Computer Performance Analysis (CPA) products.

Leisher admitted that the task of developing a computer performance program for all Clark Equipment data centers will be difficult because of the wide variety of systems in use. "Some Clark sites have systems operating under VS1 while others operate under DOS/VS or DOS. In addition, there is some Honeywell Information Systems, Inc. equipment being used," he said.

While it is a challenge to establish guidelines and procedures for the other sites to use, the group feels it will be possible to produce parameters and generalized guidelines that will keep the other sites from getting into the situation the headquarters data center had faced. In addition, it feels that if the parameters and guidelines are used, site management will have complete control over the DP environment and can select tools to help manage the complex and constantly changing environment.

At Buchanan headquarters, data center personnel are using the Boole & Babbage products to develop techniques and performance patterns for forecasting changes and anticipating problems before they occur.

Leisher explained that users and corporate management have established clear-cut requirements for improved efficiency and better management control of the system. At the same time, there's a continuing need for improved service.

(Continued on Page S/12)

'Music' Provides Control To Keep Ill. Bell Humming

By Norbert W. Szpajer
Special to CW

CHICAGO — The McGill University System for Interactive Computing (Music) is a system control program which offers interactive computing, text processing and batch support.

Music has proved to be very reliable, easy to install and maintain and suitable for use by a wide range of users. Current installations vary from educational institutions to manufacturing and time-sharing service organizations.

Music has been in use at Illinois Bell Telephone since 1973. The system was first installed at Illinois Bell on an IBM 360/40 and is now on a dedicated 370/155 with IBM 3350 disk. With this configuration, Illinois Bell supports 65 concurrent users with response times of five seconds or less.

Installation of Music is extremely easy. The system is installed in an IPO-type procedure requiring only a limited amount of knowledge in order to have an operational system within two to three hours. Most important, the installation procedure has been thoroughly tested and is reliable.

Illinois Bell has found Music to be a very reliable control program. Software problems are virtually nonexistent. In its two years of operating the current release of Music, Illinois Bell has applied approximately 10 fixes, most of which were for minor annoyances as opposed to serious problems.

Music can run on any 370 models 115 through 168, 3031, 3032 or 3033, with or without VM/370. Currently, approximately half of the Music installations run under VM/370 and half

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On the Inside

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Packages Support CICS Users' On-Line Tests

By Howard A. Karten
And Don Leavitt
CW Staff

Program creation, testing and debugging in an on-line environment are becoming more and more common but, as many users have discovered, the new life style has its own problems as well as benefits.

Happily there are various products — from various vendors — all aimed at supporting the users of IBM's Customer Information Control System (CICS) as they wend their way through the program development cycle. Some are helpful in the analysis of memory dumps after a problem has occurred, while others work right along with the user.

Clearly one of the biggest problems faced by a programmer working in an on-line situation is protecting other transactions, other programs and the complete system from the errant behavior of the CICS transaction currently under test. One of the major goals of any good support system would be to help the user curb the misbehavior as soon as possible.

Perhaps typical of proprietary packages that provide such protection and allow such immediate action to solve the problem are the Advanced Debugging System (ADS) from Gary Bergman Associates, Inc. and Intertest from On-Line Software International (OSI).

Intertest user Mike Cervine, manager of technical support at Panasonic Co. in Secaucus, N.J., said he has had the package about a year and a half and that right from the beginning it proved its worth through the storage protection it provided.

The company had only one CPU then and as systems got bigger and bigger, the special region set aside for CICS testing had to be dropped. Testing was conducted right along with live production work and storage violations "would have been disastrous," Cervine said, "but they didn't happen."

The manager is generally very pleased with Intertest — "It's a marvelous, marvelous tool" — but he is still looking for support for DL/1 files, which Panasonic uses extensively. "OSI is aware of that and I think it will be developing it shortly," he added, perhaps as a prod.

While Intertest helps out in the test environment, and the Lib/OL source program system from Applied Data Research, Inc. manages the on-line libraries, Cervine is still searching for what he feels is the company's third need: a CICS program generator, and one that doesn't provide essentially a "Cobolese" approach.

'Fascinating' Software

One of the ADS users was equally pleased with his choice. According to John Limbrunner, systems and programmer manager at Wilson Jones Co., Inc., the Bergman package is a "fascinating piece of software" that does everything the vendor said it should and paid for itself within the first six months of use.

ADS is easy for Limbrunner's programmers to understand, he said, and while that helps as they put it to work, the package has another, basically unforeseen, benefit. "Use of the system gives our programmers an in-depth knowledge of CICS they couldn't gain through any other means." By working with a "live" program, even in a test mode, they can see immediately what errors they made and what effect corrections have on the situation.

Other users of ADS took note of its support for "reaching in and fixing things." For example, data base administrator John Lauses of Allied Van Lines, Inc. of Chicago noted that the ability to look at and update records is "very valuable. When we've known we had bad records, we were able to change them so the data was in the proper format and then return to running the program."

At Telecredit, in Los Angeles, Inc., Jeff Cole said the teleprocessing network behind his company's check guarantee service "occasionally develops problems that are difficult to simulate in a test environment." On the other hand, "ADS allows us to trap those strange occurrences [before they do any harm], and I don't think any other package has that capability."

Possible Hazards

Interetest also allows a user to change records, but user Ned Hune of Credit Life Insurance Co. in Columbus, Ohio, is aware of the hazards such a facility presents. There is no audit trail, he explained, and that gives auditors the willies. Although he understands OSI may be preparing a limited version of Intertest (without the record change

(Continued on Page S/9)

Company Solves Testing Dilemma

Various techniques for evaluating software packages are discussed in the following article, which also describes one company's method for selecting a test data generator.

By Linda Martin
Special to CW

In many DP installations, as much as 40% of the DP dollar is spent on some form of testing activity. Still, applications are often improperly or inadequately tested.

These poorly tested applications are damaging to an installation because they cause development costs to exceed budget and often result in an unreliable system. The bottom line is an increase in DP costs and a corresponding decrease in confidence in the DP department.

Some of the reasons for testing problems become apparent when current testing techniques are examined. The inability to obtain test data in a timely manner and difficulty in quickly verifying the completeness and correctness of test results are two of the most basic problems.

Some current popular testing techniques are discussed below.

The Domino Technique. With this approach, the output of program (or module) A is used to test program (or module) B. This method has a serious drawback in that a delay at any point cascades throughout the system, causing havoc with the implementation effort. Further, it does not allow for programs to be tested independently.

The Special Program Techanique. Often, special "one-shot" programs are developed to obtain data or verify output. When this technqiue is used, the program must be defined, flowcharted, coded, keypunched, compiled, cleaned up, tested and executed.

Every time there is a need to change test data — and there often is — most of the above steps must be repeated. Delays and lost computer time result, and development people end up spending a lot of time trying to get test data rather than actually testing the system.

The Live Data Technique. When production files are used for testing, reliability becomes a gamble. There is no guarantee that all conditions will be tested, even if a high volume of data is processed. In addition, the task of analyzing test results is complicated, since the exact content of the data is not known and the test data cannot be expanded during the implementation effort.

The Brute Force Technique. In the most basic approach, the analyst or programmer codes test data himself, field by field, record by record. Even if test data is prepared by someone else, this is a boring, time-consuming, error-prone and costly procedure.

The Old Red-Eye Technique. This approach requires the programmer to review output manually, a time-consuming, boring job that no one likes. It results in wasted time and missed errors. An alternative method compares test output to the last "good" production output, but often the previous production data does not exist or does not reflect the very changes that must be tested, and additional programming effort is required.

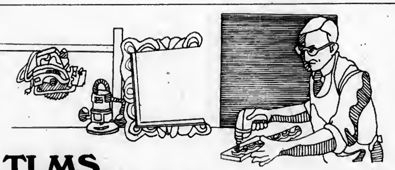
Search for Solution

To resolve this testing dilemma, Brown & Root created a project to define the requirements for a test data generator, evaluate several software packages and select the best package for our use.

To establish our requirements, interviews were conducted with each user and a list of prerequisites were published. Then a meeting was held to discuss and formalize these prerequisites and rate them according to importance.

Seven vendors — Management and Computer Services, Inc. (Datamacs II), Computer Association, Inc. (Symdata), Synergetics Corp. (Pro-test), K&A Software Products (TDG-L), MSP, Inc. (Test Manager), IBM and GPR — were then contacted and asked

(Continued on Page S/15)



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ADAPSO

Systems Software Overview Shows Wide Range

By William B. Engle
Special to CW

If you haven't taken a good hard look at the burgeoning system and utility software package field recently, most likely you are missing some good bets.

Much emphasis is being placed on applications. packages and applications-related software such as for data base management systems and data communications monitors. Dramatic developments are taking place in this field and a tremendous growth rate is predicted.

The spotlight pointed in this direction, however, may be diverting attention from the many excellent products being marketed as aids to managing computer system resources — including the important area of system-related data management — and as helps for systems and program development.

Many ingenious solutions are being offered for optimizing DP installation performance and offsetting the degradation caused by applications that were poorly planned for operation in today's advanced processing environments. Effective aids are being marketed to offset the spiraling costs of in-house program and system development.

Public's Advantage

The factors of keen competition in the field and increased maturity of the longer established software vendors are working to the advantage of the buying public in the form of more power for the money.

The ensuing product class overview summarizes the kinds of benefits to be gained from the use of currently available software. To make the picture complete, all classes of systems software are listed, but special attention is given to packages that apply to system resource optimization, system-related data management and program development — areas that may not have

(Continued on Page S/5)

SPOOLERS

($350 to $10,000)

- Significant throughput increase
- Peripheral pooling; automatic allocation/deallocation
- Partition balancing, device equates, job accounting, JCL procedure libraries
- Ability to expand to utilize unused core; significant reduction in core requirements
- Shared use by multiple CPUs

DATA HANDLERS

($595 to $36,000)

- Provide significantly more efficient and faster access methods
- Supplement OS job management functions for very significant throughput improvement
- Provide on-line access to system data sets
- Offer reduced channel and control unit time to read sequential data from disks
- Offer virtual access method for MVT
- Offer IBM 370 functions for 360 systems
- Provide significant augmentation of IBM OS/360 job management
- Provide comprehensive multistep job restarting
- Execute complete job streams without handling JCL
- Create JCL procedure library in any partitioned data set
- Process DOS job stream on any partition without JCL change
- Offer very flexible dump and copy facility

PARTITION BALANCERS

($2,000 to $3,000)

- Has optimum CPU and I/O processing balance
- Provides throughput increase as high as 30%
- Offers significant channel usage time reductions
- Ensures that CPU-bound jobs will not freeze out others
- Sets priorities by analyzing general operating characteristics of jobs

SORT/MERGE UTILITIES

($350 to $7,000)

- As much as 30% reduction in sort time
- Most appropriate optimization modes (i.e., I/O time, CPU time, I/O accesses) user-selectable
- Disk space used efficiently without JCL changes
- Sort exits writable in Cobol
- Secondary sort space automatically obtained
- Parameters alterable from invoking program without necessity to recompile the program
- Best executing mode dynamically determined in on-line systems

TAPE/DISK UTILITIES

($175 to $15,000)

- Benefit of Vsam for nonvirtual shops
- OS-like disk management for DOS systems
- Isam, Vsam replaced for significant improvement in efficiency
- Disk files compressed 30% to 60%
- System libraries built, reorganized and condensed
- Tape read errors reduced 30% to 50%
- Disk loading/unloading to tape done quickly, saving disk resources and minimizing pack changing
- Vtoc analysis and reporting improves disk utilization
- Disk housekeeping functions with automatic release of unused areas
- File and library backup with automatic Isam reorganization
- Workspace automatically assigned to application programs
- Jobs scheduled to complement each other, make better use of CPU time

PERFORMANCE EVALUATORS

($1,000 to $60,000)

- Measure how well your software is using your hardware for a given job mix
- Especially useful with MVS where user has unprecedented control over how jobs are processed and the amount of resources they can use
- Detect (some resolve) queuing conflicts, reserve lockouts, job looping or hanging in wait state, CPU thrashing, core fragmentation
- Automatically reorganize system data sets
- Provide comprehensive job billing as auxiliary function
- Have real-time analysis and outputs
- Show jobs in memory awaiting CPU or jobs with peripherals assigned awaiting memory
- Simplified reports need less skilled analyst for interpretation

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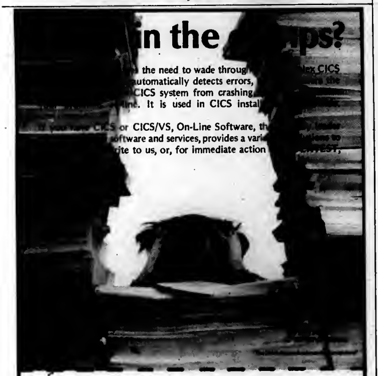

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# of Performance Benefits

(Continued from Page S/4)

been enjoying as much of the limelight as they deserve.

For succinctness, typical features are shown in composite form to serve as an overall guide to the kinds of benefits that may be gained. It will be obvious from the wide range of prices shown in each category that not all of the packages have all of the features.

An analysis and investigation of the individual products in these categories will almost certainly turn up some candidates for at least a modest payoff and, chances are, very substantial benefits can be reaped. It is a rare shop indeed that has all of these bases covered.

Engle is the software editor of Auerbach Computer Technology Reports, *which are published by Auerbach Publishers, Inc. of Pennsauken, N.J.*

DATA BASE MANAGEMENT SYSTEMS (DBMS)

($3,000 to $120,000)

While some users may find it necessary to design their own DBMS, most should be able to satisfy their needs with one of the many excellent data base management systems commercially available. These systems cost only a fraction of what would normally be expended to design a custom package, have proven to be totally reliable and cost effective and are supported by competent software professionals.

INFORMATION STORAGE AND RETRIEVAL (IS&R)

($4,000 to $140,000)

The objective of IS&R software is to facilitate the retrieval of documents or text extracted from documents. Documentation retrieval includes helping the user locate the document, outputting textual documentation summaries (e.g., abstracts, extracts) and amplifying information (e.g., bibliographical citations containing title, author and publisher) and providing entire documents. Some types of IS&R systems retrieve formatted data that is not part of the documents or text.

DATA COMMUNICATIONS MONITORS

($6,000 to $75,000)

These monitors manage critical system resources such as memory and processor time and provide access for other components to a variety of services and physical facilities. Functions which must be provided are task scheduling, interrupt handling, I/O management, mass storage space management and operator interfacing.

SOURCE PROGRAM MANAGEMENT

($1,250 to $11,000)

- Has advantages of OS for DOS installations
- Has authorization and security controls to prevent wrong library from being updated and to prohibit unauthorized updates
- Offers highly compressed mode that allows substantial disk savings
- Lets entire modules be inserted, deleted or replaced
- Stores JCL statement sets and test data
- Provides backup and recovery to as many as 15 prior levels
- Provides paired functions of linkage editing and library maintenance
- Generates job streams automatically
- Scans for updating based on various conditions, makes data string and substring substitutions
- Allows temporary addition of statements to a member in a job stream without change to master
- Provides error checking in modifications
- Automatically reuses space when deleting
- Controls simultaneous updating
- Provides call interface for user-written programs
- Offers unlimited storage of temporary updates for program development
- Provides comprehensive reports detailing library status and changes

TAPE LIBRARY MANAGEMENT

($5,000 to $11,000)

- Has complete control over installation's tape library
- Rejects wrong tape mounts and prevents inadvertent overwriting
- Automatically maintains list of scratch tapes based on expired retention dates
- Allows tape drives to be shared across DOS partitions
- Pinpoints correct historical masters for recovery situations
- Traces a data set through previous generation even though data set name has changed

Data Management and Communications

PROGRAM AND DATA GENERATORS, CODE OPTIMIZERS

($4,500 to $27,000)

- Give drastic reduction in program preparation and execute times
- Eliminate much Cobol verbiage through macros, with reductions in code of as much as 60%
- Reduce size of OS or OS/VS Cobol object modules
- Produce machine-efficient and documented Cobol programs from problem-oriented specifications
- Offer runtime debugging and program performance monitoring
- Aid in development of data gathering, inquiry and conversational Cobol applications
- Provide decision table analysis
- Facilitates semi-automatic programming for generating structured programs
- Generates Cobol programs from simple statements prepared by nonprogrammers
- Permits data definitions and 77-level entries in procedure division

PROGRAM TEST/DEBUG

($4,000 to $15,000)

- Measures execution characteristics of Cobol programs
- Debugs, tests and optimizes Cobol source code
- Generates data files to test programs written in any language
- Debugs, times and analyzes Fortran source code
- Generates highly flexible test data for Cobol programs
- Reports execution activity by the user's symbolic procedure names
- Provides flexibility that makes programmers want to use the test facilities
- Rapidly checks output files and documents errors as they occur
- Allows unconverted DOS programs to run on OS and OS/VS systems
- Effects up to 50% reduction in paging

PROGRAM TRANSLATORS

($3,000 to $10,000)

Various packages are available for translating programs from a language no longer used to a currently used language, including Autocoder to Cobol, 1400 to Cobol, BAL to Cobol, Easycoder to Cobol, PL/I to Cobol, RPG/RPG-II to Cobol, Autocoder to PL/I, Burroughs Corp. to IBM and Honeywell Information Systems, Inc. to IBM.

REPORT GENERATORS

($2,500 to $20,000)

This has become a very generalized category of software that is basically characterized by the ability to provide formatted outputs from computer files through the use of simplified parametric inputs prepared by nonprogrammers. Services range from simple report formatting to fairly complex file creation and manipulation, including interfaces with data base systems for sophisticated information retrieval capabilities. Several packages were specifically designed to meet the needs of organizational auditing staffs.

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Systems Cut Back on Need for Detailed Coding

(Continued from Page S/2)

that the user describe what he wants done; then the DMS assumes the responsibility for generating and executing the detailed coding required to satisfy the user's requests. In developing software to do this, DMS designers have stressed certain functions; e.g., fast retrieval for highly complex queries may be achieved at the expense of high overhead entailed in updating and maintaining the required file structures.

Thus some features in one DMS will not appear in another — yet both will be properly classified as data management systems. With this qualification, the following are among the principal characteristics generally agreed to be desirable in a DMS:

- Has a report/request language that is easy to learn and use.
- Makes information in computer files directly available to nonprogrammers.
- Relieves programmers of simple repetitive report generation and file maintenance tasks.
- Relieves users of the need to be concerned with device types, I/O processing and control and file structures.
- Supports a variety of file structures.
- Handles multifile processing.
- Provides a convenient interface to a data base management system and its files.
- Supplies error diagnostics.
- Is available in special versions (e.g., auditing, personnel reporting, or portfolio analysis) to meet specialized application requirements and/or in a version that supports an interactive mode of operations.

An important distinguishing feature among data management systems is whether they function as report generators or program generators. A *report generator* usually functions as a "load and go" system, meaning that the required coding is generated and the requested report is produced, all in the course of a single job step. A *program generator*, sometimes called a "precompiler," usually translates the user's instructions into a source program that must be compiled prior to its execution.

Report generators typically have the edge in convenience of use and provide the fastest response to one-shot report requirements. Program generators, on the other hand, can be relatively hardware-independent and will usually deliver improved run-time efficiency in the production of regular reports.

To justify the cost of a DMS, an organization should try to select a system that is applicable to many types of applications; performs all — or most of — the tasks required by these applications; and efficiently uses all DP resources: programming time, computer time, memory space and the user's time spent in preparing his requests.

To illustrate some of the complex considerations involved in defining an organization's data management needs, consider an environment within which exists:

- A production planning group with limited product control reporting needs, slow turnaround reporting and no tie-in with purchasing and inventory control systems.
- An administrative function where manufacturing personnel reports and payroll are separate systems and the plant data collection system is used only for time and attendance reporting.
- No central system for sales forecasting and marketing studies.

What characteristcs must a DMS have to meet the needs of this type of organization? If the reporting requirements and the lack of system interfaces are recognized as the key criteria, the production planning area is a good place to start in seeking solutions. The control of the reports is in the hands of the production planners, who normally have little or no DP experience.

Therefore, the DMS must have a report/request language that is easy to learn and use. The DMS must also have data extraction, data query and file maintenance capabilities. The majority of the current data management systems meet these requirements.

Administrative Area

In the administrative area, the DMS should handle the following applications: maintain a manufacturing personnel file, collect and analyze data from the plant (e.g., man number, job worked, hours expended, etc.) and do the reporting and check writing for the company's payroll.

The requirements are now becoming more complex, since the DMS must now handle "multiple file processing." The administrative applications, we assume, can be organized logically and efficiently by storing different types of data in different files.

Now, as a further distinguishing factor in evaluating the competitive DMS, let's assume the marketing manager wants a sales forecasting method based on a statistical measurement of demand over a five-year period, and a bar graph showing sales dollars by salesman. The DMS must now be able to compute the necessary statistics and have the data manipulation language necessary to control the selection of the x-axis and y-coordinates for the bar chart.

These are the types of problems that must be resolved in defining data management needs and selecting the most suitable DMS.

Herbert Gepner is the managing editor of Datapro's Directory of Software published in Delran, N.J.

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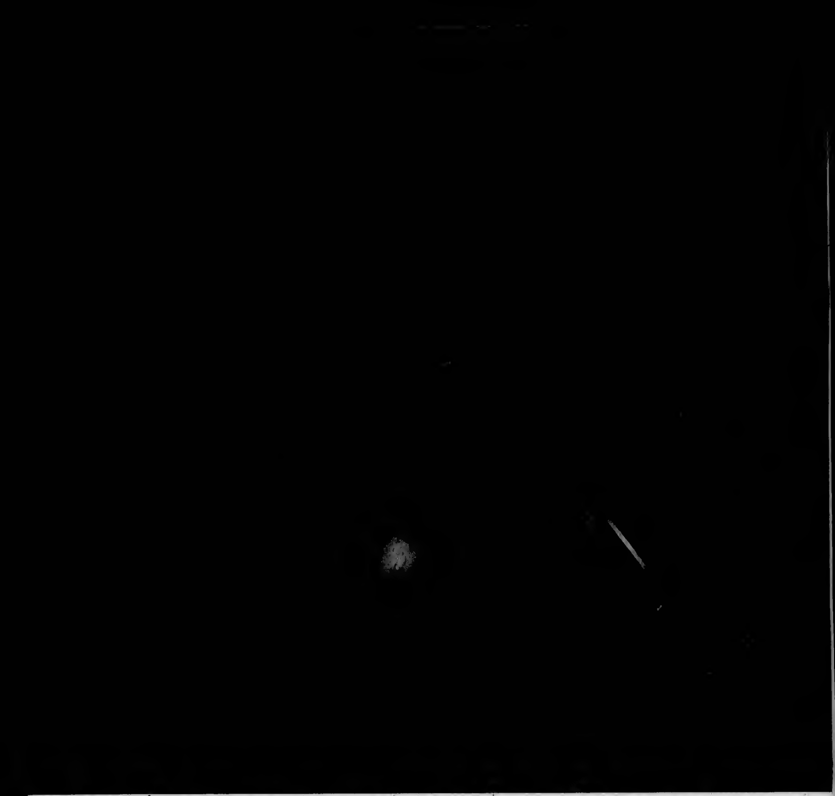

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Enhances IBM 370/135

Hospital Happy With Source Library Package

By James McGork
Special to CW

ALBANY, N.Y. — About a year ago, the Albany Medical Center Hospital shopped around for source library maintenance software to enhance an IBM 370/135 with 192K of real memory under DOS/VS, running on-line under CICS/VS and with two batch partitions under Power/VS.

In May 1977, we acquired and installed the Source Library Maintenance System (Slick) from National Computing Industries (NCI). The decision came after a close look at Pansophic Systems, Inc.'s Panvalet and Librarian from Applied Data Research, Inc.

The office that houses our programming staff is located two blocks from the main hospital, where the computer is. Because there was no adequate space available for storage of source programs, it was necessary for each programmer to carry the ones needed daily to and from the computer room. This became a very cumbersome task. Slick has eliminated that problem.

Installation of the Slick software was smooth and simple. Proceeding from the cataloging of all modules to the formatting of the initial library took less than 30 minutes of computer time. The documentation is clear and concise, keeping the desk-time requirements to a minimum.

Training the programmers to use the product consisted of little more than providing each one with a copy of the "Programmers' Facilities" section of the user's guide and making them aware of the established system standards.

Library Complete

At the end of our first year of operation with the system, we have a complete library (both primary and secondary) consisting of more than 800 members.

Vendor support is always a concern when evaluating a product such as Slick. Recently, we had occassion to call upon NCI for assistance. Suddenly, during a test session, all fetches of the Slick system programs resulted in abends because of addressing exceptions.

We decided to place a call to our marketing representative. He immediately put us in contact with a technical expert. After approximately 15 minutes on the phone, answering questions and providing information from the system core dump, NCI determined that the first track of the Slick primary library had been overwritten by a program in the early stages of testing. A corrective course of action put us back in business within 45 minutes.

With an eye to the future, we are considering an on-line program maintenance product to completely overcome the problem of being so far removed from the computer site. NCI currently has a very impressive product available called OWL which provides this capability and an easy transition from batch. Because of our favorable relationship, the quality of NCI software and its excellent support, we are planning to purchase this product.

We have recently concluded evaluation of several disk space managers. Again, for reasons of price/performance, we have chosen another product from NCI, Diskotek. It performed well on our system during testing and the documentation was such that it was very easy to implement.

McGork is manager of programming for the Albany Medical Center Hospital in Albany, N.Y.

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Packages Aid Testing in On-Line Environment

(Continued from Page S/3)

feature) for use by application programmers, Hune currently controls all Intertest work from within the systems programming staff.

Hune named the package's ability to monitor a specific transaction as it is running as perhaps unique and certainly its most useful feature. "It's worth its weight in gold," he exuded. "The user can name the transaction. Then the system tracks it to make sure it can still be reentered and doesn't create any storage violations . . . all of its most important characteristics.

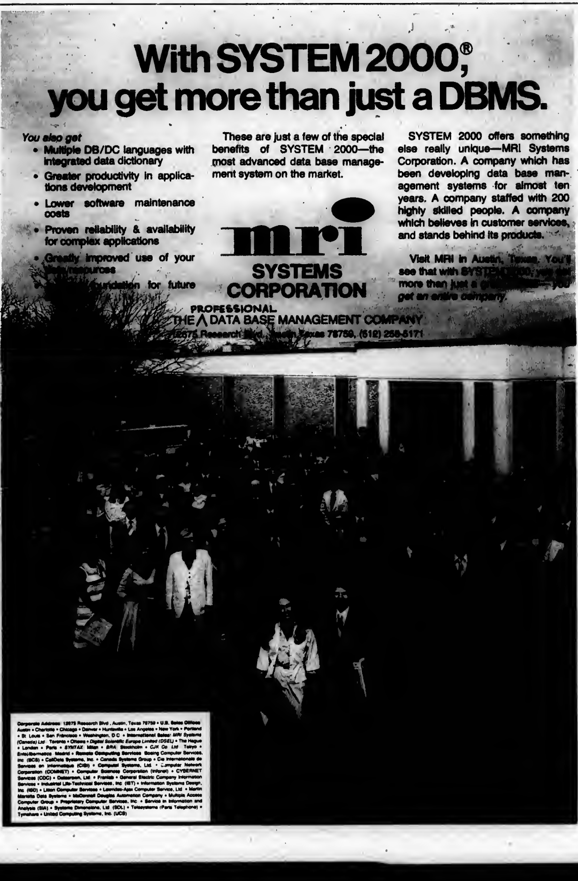
"And," he continued, "if it senses a storage violation coming up, it stops before any damage is done." While that is comparable to the handling ADS provides, Hune said he wasn't aware of that package.

He noted his shop is "right on the limit of DOS" and anticipating a move to MVS within a couple of years. Credit Life was the first installation of IBM's 3031 processor and it is still in effect a beta test site for DOS/VS software development.

According to Hune, his shop has received copies of the tape of software changes made in Europe and transmitted by satellite to this country at the same time — and "sometimes before" — the tapes reached IBM's own staff here.

With that kind of a situation, he noted, the company is very careful about the outside software it uses: it doesn't want IBM to be able to blame any of its problems, when and if they occur, on the presence of problematical programs.

Hune went ADS user Limbrunner one better in his estimate of the payback period for Intertest: he said the package paid for itself in its first week, by showing errors in storage protection and reenterability that had been buried in the existing coding under MTCS — "sort of small, subset of CICS." The company was converting to CICS and Intertest concurrently and if those errors hadn't been spotted, the situation would have been out of control, he said.



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Cost, Ease of Use Guide College System Choice

By Marcia Blumenthal
CW Staff

HIRAM, Ohio — Knowing that Hiram College's "home brew" of computer programs was inadequate for the creation of a consolidated data management system, Frank Rossiter, director of administrative computer services, went out-of-house to acquire a general software system.

However, the college had several limitations, the most important of which was cost. "Today, education is not rolling in money," Rossiter said, adding that Hiram is a small liberal arts college with 1,000 students.

In addition, Rossiter said, the system "would have to allow noncomputerish personnel using simple commands to access a data file; make inquiries, changes, sorts and selects; and get subset listings."

Compatibility with the college's Digital Equipment Corp. PDP-11/40 running under RSTS/E was another important factor. The college could not afford any additional hardware.

Aside from the PDP-11/40, the college has 20 teminals — about half CRTs and half teletypewriters — and two line printers.

After evaluating several systems, Rossiter decided on Quodata Corp.'s QDMS because it was general enough to meet a broad range of the college's present and forecasted DP needs, without exceeding budgetary constraints. The system cost $5,000, Rossiter said.

Although at the present time the system is only used by the alumni office for its data file, Rossiter expects to expand its use to include admission records and registration functions.

Rossiter was particularly appreciative of Quodata's willingness to provide an in-house demonstration. "The company sent us the documentation and a tape and told us to give it a try. Since the product is fairly new and not as well tried, I had several questions and Quodata was more than willing to give instruction," Rossiter reported. Other companies, he said, were not willing to do this.

Aside from this perceived lack of service by other software firms, Rossiter noted that the nearest package in terms of functionality cost $8,000. In addition, Rossiter said other systems would have required the purchase of more hardware.

Some Trade-Offs

While the system is running relatively efficiently, Rossiter noted some trade-offs in using QDMS.

The primary trade-off is speed. "QDMS is written in Basic Plus and is only as fast as the processor it is run on," Rossiter explained. If the college had a faster processor, it would get better results, he added.

Another negative factor is the loss on the input side, according to Rossiter. More expensive systems had more generalized updating facilities. A CRT allows field editing, he noted, but while QDMS does have this capability, it would have required the purchase of a special terminal.

"Instead, if you don't have the special type of terminal," Rossiter said," users must utilize a hard-copy terminal or use the CRT as a dumb terminal to do updating." Quodata is pressuring its staff to overcome this difficulty by developing more general field and page updating capabilities, he said.

Because the system is relatively new, Rossiter said it has a few more problems than an older, more established system. "It has some bugs that should be cleaned up and it needs more documentation."

For example, "if a person moves and we want to delete a line of the address," Rossiter explained, "the only way I can blank the line is by putting in a character — a period or a

(Continued on Page S/14)

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To Develop Guidelines

Study Assessed Query Language Resource Use

By W.H. Inmon
Special to CW

Generally speaking, the higher level a language, the more overhead at execution time. A lower level language usually can be written to execute more efficiency than a query language or report generator.

Indeed, the strength of report and query languages is their versatility and ease of use by unsophisticated users, not necessarily their efficiency. Although the tradeoffs between high-level and low-level languages can be identified, a precise quantitative comparison is difficult.

As part of a study of query languages, an attempt was made to measure the differences among several languages in resource utilization at execution time so that guidelines might be developed. Many aspects of the programming environment that affect performance could have been varied, but in order to produce an acceptable conclusion within a reasonable amount of time, an application that shared characteristics with many others was selected as a test case. The application was then coded in different languages and the resources used at execution time were measured.

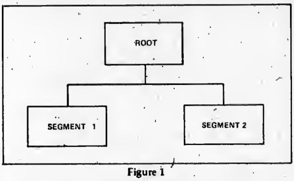

Figure 1

The application consisted of a job stream that produced four reports in a batch IMS data base environment. The data base contained about 60,000 segments and was structured as in Figure 1.

The reports were produced by scanning the entire data base, extracting specified records, sorting them, accumulating data and finally formatting the results. The program logic was not complex. The processing consisted primarily of accessing a data base and formatting reports.

Because of constraints, the time spent in programming was not measured. Program development was done by experienced personnel and the programs produced were as nearly equivalent as possible. A program was not optimized by using features peculiar to its languge unless the other languages were capable of similar optimization.

Deciding on Criteria

Because of the differences in the languages and especially the differences in the way they interfaced with the data base, it was difficult to decide exactly what should be included in the measurement of resource utilization.

For this reason, some resources were measured and were not directly part of the programming language itself, but were essential for the successful execution of the program. Therefore, resource utilization measured all work done from accessing the data base to the production of the reports.

One of the languages used to produce the reports was PL/I, written as the representative of low-level language (or "native code"). Assembler language was not considered because it was felt that in normal cases, Assembler would not be used to produce reports even though it would use less resources than PL/I.

PL/I was run from a load module (i.e., precompiled and linked) because that would be the normal mode of operation. The applicable compile and link time is included as a footnote, however, so that comparison can be done against languages that require compilation for each execution.

Mark IV is a report writer language. The Mark IV approach to reporting is to scan a data base once, extract appropriate data, generate as many records per data base record as will be necessary to produce all reports, sort the data, then process it sequentially and write reports. Mark IV is compiled each time it is run.

Two Basic Modes

It was run in two basic modes — standard processing and Mosaic (single-leg) processing. While in Mosaic (single-leg) processing mode, only two segment types were accessed, while in standard processing mode, all segment types were accessed. Mark IV requires an interface to IMS to access the data base.

Ramis differs from Mark IV in that Ramis was designed to be run from its own data base, not an IMS data base. The structuring of the data in a Ramis data base has certain fundamental differences from an IMS data base (i.e., the structure and contents of the data are not exact equivalents of each other).

Ramis is compiled each time it is run. It was run in two different modes — with a Ramis-IMS interface and by using a PL/I program to create a sequential copy of the IMS data base, creating a Ramis data base from the copy, then producing the reports from the Ramis data base.

GIS/VS was run two ways — from a compiled and linked load module and from a load module produced from source text entered at the start of the job. GIS does not require an IMS interface. In relation to the others, it handles the IMS data base environment more easily.

Data Base Descriptions

Each language requires a certain description of the data base before processing can occur. This descriptive process is different for each language. It is difficult to say what should be applied to the overhead for the running of each program because the descriptive process for each language is not easy to determine.

Therefore, whatever description would normally occur for each execution of the program was measured. In any event, the resources consumed by data description was small.

As expected, the native language coding performed better than the query and report lan-

(Continued on Page S/14)

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ADAPSO

ICP MILLION DOLLAR CLUB

Equipment Firm Fends Off Problems in Performance

(Continued from Page S/2)

Because it is so heavily involved with CICS, the data center has very high exposure and visibility with users. Ninety percent of all terminal response time must be within four seconds. This network will be expanded and the same type of response time must be maintained.

"We're already at maximum during our prime shift," Leisher commented, "and that means we are just exposing ourselves even more. Because of this, performance monitoring is becoming a vital part of our operation. While some jobs can be moved around to various shifts, there are certain jobs which have time commitments. That means we have to continually tune our system and improve performance."

To accomplish this, the Clark Data Center runs CPA daily. This helps it keep track of user workload and system performance. The center can develop usage statistics on the CPU, main storage, tape and direct-access storage devices as well as paging and swapping.

It can also keep track of the IPL frequency, device configuration and shift performance statistics as well as workload and device allocation needs.

Better Control

Leisher explained that these statistics provide improved management control and overall performance evaluation. When he receives a complaint from a user that response time was bad during a certain time period, he can examine the reports to determine whether the complaint is valid. If it is, he can then use the other software tools to determine the exact causes.

To continually tune the system, Leisher and his group use TSA to measure system and program modules, measure the calling job name of each module, plot CPU busy time for modules and develop histograms of usage of any module. This helps them identify high-activity modules that require optimization, plot high usage times and determine CPU usage by actual address in the program and determine the causes of wait time within programs.

He explained that this helps achieve system improvements that can carry across to all users and teleprocessing improvements that keep response time low.

To handle configuration measurement, the data center uses CUE/DSO. By measuring the execution activity of hardware and software resources, personnel can identify bottlenecks in the CPU, channels and devices.

Because of the importance of fast response, Leisher and his group keep a close monitor on disk volumes, head movements between data set pairs and data set placement. Using data set optimizer reports, they are able to easily determine pack mapping, head movements by data sets and establish an effective pack reorganization. This reduces contention time and improves the utilization of the space on the packs.

"If we were to rely on the procedures we used in the past," Leisher concluded, "we'd be making decisions by the seat of our pants. Eventually we'd be right back in the same situation we were last year with our back against the wall with poor service and irate users.

"We *never* want to be in that situation again, and the only way we can ensure this is by constantly monitoring and tuning our system."

'Music' Harmonizes Well

(Continued from Page S/2)

run in a stand-alone environment.

At initial program loading (IPL) time, Music determines if it is running under VM/370 and, if so, in a V=V or V=R region. This information is used throughout the system to optimize performance based on the environment and to determine if VM handshaking should be performed.

Music is highly compatible with the OS/VS systems because of the extensive use of OS/VS compilers and a linkage editor scheme similar to OS/VS.

Music also comes with a system module update program that uses a context editor approach to updating as opposed to a sequence number.

The currently supported compilers and language processors for Music are Fortran G1, VS Basic, Cobol Version 4, Assembler F and APL.

Music includes the following packages:

- Music/Script, a text formatting facility based on CP/67-CMS Script.
- Music/FCS, a Music/Fortran checkout subsystem that provides debugging facilities for Fortran G1 users.
- Statpak, a conversational statistical package.
- Cogo, an implementation of the IBM 1130 version of the Civil Engineering Coordinate Geometry Program.

The terminals supported by Music are IBM 3270 (in local mode only), 3767 (2741 mode), 2741 and 1050; and Teletype Corp. models 33, 35 and 38.

At Illinois Bell, all terminals used on Music are Teletypes or Teletype-compatible.

However, many Teletype-compatible terminals have slightly different operating characteristics such as rate of carriage return, line ending sequence and backspace characters. Music provides capabilities to control these devices with minimum user involvement with system control block defining specific operational characteristics of a particular terminal.

The user simply enters the type of terminal at sign-on time. We have found this feature to be extremely useful in supporting the wide range of terminals in use at Illinois Bell. Using this feature, Illinois Bell has completely eliminated extensive system code modifications in order to handle these differences.

The Music program is available from IBM as IUP 5796-AJC.

Szpajer is chairman of the Music Users Group. Anyone interested in the users group can contact him at Illinois Bell, 225 W. Randolph HQ-4C, Chicago, Ill. 60606.

Packages Help Steel Firm Manage RJE Sites

Special to CW

MIDDLETOWN, Ohio — Twenty-eight remote job entry (RJE) sites feeding into one regional computer center can make providing direct access storage device (DASD) management and program security quite a trick. Armco Steel Corp. here solved this situation six months ago with one fell swoop by acquiring a pair of proprietary software packages.

Jack Current, computer support adviser for Armco, explained that with 28 RJE locations, "people were always trying to overallocate disk space and we were faced with the tedious task of manual disk space management. We spent incredible amounts of time compiling handwritten lists from large detail listings of most disk packs using IBM's Mapdisk or lehlist."

Current found that while converting from IBM 3330 disk drives to 3350s, he was able to use Pansophic Systems, Inc.'s disk analysis and data set management package, Panda, to reclaim the space of at least two 3350s. Over the next months, he was able to reclaim three more packs.

RJE sites using this Ohio facility are located at plants in Kansas, Texas, Kentucky, Maryland and Pennsylvania, as well as at a coal mine in West Virginia and four RJE locations within Middletown itself. The Belefonte Insurance Co. of Dallas — recently acquired by Armco — is a new RJE site that has been putting special demands on the regional computer center.

The Ohio DP center runs an IBM 370/158 and two 370/168s. The center has 38 3350 disk drives. Almost 30 people at the center use Panda for daily monitoring of management information system values and data base reallocations. Some of the smaller RJE sites use Panda on a weekly basis, often running compression lists at night or on weekends.

"I know Panda has more than paid for itself in the space it already has given back to us," Current said. "It's a good package and I especially like getting a one-line report of each data set. With all the information at our fingertips, it makes DASD management a lot easier."

Pansophic's Panvalet, while not as heavily used at Armco, also has provided a disk management service to the Armco General Office, one of the four Middletown RJE sites hooked into the regional computer center. Bob Stein, who manages DASD resources there, has just installed Panvalet in the systems improvement department, which has four libraries: a Cobol, a BAL, a PL/I and a test library.

"After copying all four libraries into one Panvalet library, we realized about a 50% savings," Stein claimed. "By using the compression factor and cutting down on dead space, we went from 85 cylinders needed for these four libraries to 40 cylinders necessary for the Panvalet library."

Research Firm Reduces Test Data Costs by 90%

Special to CW

PRINCETON, N.J. — It has been three years since the Educational Testing Service (ETS) here recognized the need to focus attention on the computer program testing function.

"Concurrent with our increasing dependence on DP," programming supervisor Richard LiMato said, "was the ongoing need to further improve the quality of our programs — a goal that was dependent on our ability to implement a test procedure to verify our software product's ability to perform to a well-defined standard.

"Conventional methods for the creation of test files and testing of program logic proved to be a headache and not as accurate as we wanted," LiMato added.

Today, ETS, a large nonprofit corporation devoted to measurement and research, primarily in the field of education, has gotten where it wants to be — producing comprehensive test data in a simple, straightforward manner, and doing it at a documented 90% reduction in cost.

ETS's computer facility is based around an IBM 370/158 utilizing a 3350 direct-access storage facility and an IBM 360/65 with 2314 and 3330 storage modules.

ETS conducted an extensive survey of available software products for test data generation, established a checklist against which numerous products were evaluated and then did in-house benchmarks of the top three products.

Each package's relevant value to ETS was gauged through a series of questions:

- Does the basic function of the package meet ETS needs?
- Will the package run in present and future environments?
- How well do the detailed capabilities of the package match ETS requirements?
- Is the performance adequate for ETS needs?
- Is the package flexible?
- How difficult will it be to use and train other programmers and systems personnel?
- Will the package be easy to use?
- Is adequate documentation provided?
- Was good technical support provided?
- What is the operational status of the package (how many users)?

"A test data generator package is not expensive, costing much less than $10,000," LiMato emphasized, "but the impact it can have on the entire system life cycle is many times that. DP reference services, trade magazines and vendor salesmen all play important roles in providing information about a software package's capabilities, but the number of variables requires that the user establish his own criteria and evaluation methods."

"Putting it simply," LiMato said, "there is no shortcut to getting the right software for your installation. Vendors were particularly helpful, providing us with samples, documentation, literature and even free trial periods to evaluate their products first-hand. I think this reflects a realization by the industry that, despite the rapid growth of the DP function, software will continue to receive serious scrutiny from the serious buyer."

Beyond the expected capabilities of a test data generator, ETS knew it wanted a package that was well supported by the vendor, had good documentation and did not require significnat overhead in its operation, he said, and in looking at some of the other software, "we had the impression we were helping debug the software or prove a particular option did work.

"There were some potential purchase price savings on these products," he continued, "but we were looking for the best product, not especially the best price. It's important in any evaluation that the user not lose sight of his management's needs or his own mission in computing. Inadequately tested programs can't be justified months or years later by the up-front savings of $1,000 or $2,000.

"We were fortunate," LiMato said, "because the product we ultimately selected — Datamacs, from Management and Computer Services, Inc. — was the most outstanding package in meeting our requirements of generating comprehensive test data and doing it in a simple, straightforward manner. In addition, it was clearly a more professionally produced package than the others, having then more than 300 satisfied customers, a number of whom we contacted and got reaction that confirmed our decision."

The supervisor recalled that the final "convincer" was an occasion when one of the programmers needed test data in an extreme rush for a program she was working on. Datamacs provided her with test data that afternoon and gave ETS a trial case against which it could compare manual preparation of the same test data.

The results were impressive, he said. The cost for Datamacs to generate the test data was one-tenth of that with the conventional (manual) method. After months of experience using Datamacs, these same significant savings are being maintained, he reported.

"Despite the fact that Datamacs represented a new discipline," he recollected, "we encountered very little resistance from our programming staff, although several programmers did not want the Datamacs statements embedded in the program. We resolved this simply by using standard library file definitions.

"If any installation is to obtain maximum usage of Datamacs," he reflected, "testing standards must be established . . . and must be enforced. Otherwise, it will not be utilized.

"A failure to establish a standard is simply a reason for the technicians to vary in the techniques of testing. And that translates," he concluded, "into varying levels of quality of software programs."

DOS & DOS/VS USERS

CPU - to - CPU

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ADAPSO

ICP MILLION DOLLAR CLUB

Study Evaluated Languages' Use of Resources

(Continued from Page S/11)

guages. Even with compilation time included, native language coding was more efficient.

The differences between GIS and Mark IV are minimal, which is surprising since they take such a different approach to processing. The biggest variance in resource consumption comes in the case of Ramis. When the IMS interface is used, the processing time is a little more than it is with the other languages.

This is surprising because internally Ramis does a considerable amount of work — it retrieves an IMS record, restructures it, then handles it in a Ramis mode. A good deal of work is done just to be at the place where Mark IV or GIS begins to process the data.

Ramis-PL/I Interface

The one case that was really surprising involved the Ramis-PL/I interface. This job used more resources than any other language or mode of execution. An examination of why it did so leads to some insights:

First, the amount of resources consumed in dismantling a data base in one environment then reconstructing it in another is considerable. The results of the test show this case with the PL/I interface included, then excluded. From this, it is evident that to produce the reports, the PL/I interface uses approximately as many resources as does the entire execution of one of the other languages.

Even with the PL/I interface excluded, Ramis uses more resources than other languages. This was a result that was not expected. It would seem that the resources used here should be less than in the case of Ramis with IMS interface. The reason for this phenomenon is that when the data base is rebuilt, data is constructed so that Ramis does not handle the new structuring of data in quite the same way IMS does.

Data Handling Differences

In general, data management systems have fundamental differences and a form of data easily handled in one system may prove to be awkward in another. Such was the case here. Ramis spent considerable time handling what (to it) was an error, but was not an error in IMS.

Without this discrepancy, Ramis would have performed better. This difference means there can be an impact on performance when converting data from one environment to another. If allowance is made for the differences between IMS and Ramis, it is likely that the actual Ramis time spent in execution would be equivalent to the time spent by Mark IV or GIS.

There are several factors that could have been changed that may have affected the outcome of these tests. The data base could have been more complex. More than one data base could have been accessed. The program logic could have been more lengthy or difficult. There could have been a bigger volume of data or different distribution of the segments. The tests could have been conducted on programs that update the data base.

The constraint of time and other resources limited the analysis of other factors.

In summary, the test shows that in this case, native language coding performed significantly better than query or report languages. Conversion of data from one data base environment to another was expensive. In addition, changing data base environments may introduce discrepancies in the data that are expensive to handle.

The strength of higher level languages is their ease of use and their versatility, but it should be recognized that there is an inherent operational cost to pay for their generality.

The above was based on a study done at Standard Oil Co. of California. Inmon is now a data base consultant at Amdahl Corp. in Sunnyvale, Calif.

Cost Guides School's Pick

(Continued from Page S/10)

quote — but I can't make it completely blank. This is definitely a bug."

Several Pluses

On the plus side, Rossiter said Quodata is making available a set of subroutines that allow the easy creation of programs to access a data file in extremely nonstandard ways.

Furthermore, he is highly satisfied with the report writing capability of the system. The ever-present problem of special reports is solved by the "PDQ Report," Rossiter noted. This function allows the generation of columnated reports from answers given to a series of prompting questions. All reports can be printed in any order the sort can produce, he added.

"Quodata spent a lot of time developing the output quality of the program, giving the user great flexibility in generating reports including totals, subtotals and table lookups, which are common to more expensive systems," Rossiter noted.

Summing up the college's experience of acquiring a new system, Rossiter concluded, "we tried to be very practical about it, and QDMS' functionality outweighed the loss of speed."

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As Business Needs Grow

Companies Can Upgrade Gracefully From DOS

By Jeffrey Bender
Special to CW

An old Chinese curse: "May you live in interesting times!"

A modern IBM curse could be, May your business grow and prosper!" What does a company do when its pretty little DOS begins to strain under capacities and applications undreamed of when it was installed? Suffer, probably, because an upgrade to OS will have the programming staff diving for aspirins.

I've encountered that situation several times in the last few years. No one wants to hazard a rewrite of a complex system.

As flexible as OS is, however, it does encourage structuring systems in certain ways to make full use of its functions, and if programs are written in Assembler language, all the I/O must be changed.

Not to mention; of course, the very powerful but very complex Job Control Language to be mastered. But if a company needs more than DOS, what can it do?

Plenty. First, get an older release of DOS/VS that has been around long enough to be bug-free. If the firm is fortunate enough to have plenty of main memory, it can turn off the Dynamic Address Translation feature to avoid the virtual storage obligations, and bingo — there will be five partitions instead of three.

A more recent release will give eight partitions, and each upgrade adds features to make the operator's life easier.

OS-like software can be obtained from a number of companies to maintain virtually any data base or to add functions to the system. For communications, a front-end processor will do wonders for sagging response time.

These system additions may be all a user will ever need. If not, at least it will give a company valuable breathing time to chart its DP direction and grow large gracefully.

Bender is a director of Nightowl Software, a programming and systems analysis firm in Mohegan Lake, N.Y.

Company Solves Dilemma

(Continued from Page S/3)

to review our requirements and to rate their systems accordingly.

Of the seven original vendors, Synergetics, IBM and GPR met our requirements. Pansophic Systems, Inc.'s Easytrieve, an in-house report generator, was also placed in contention.

Each vendor was then asked to give a formal product presentation to the user group. Easytrieve's potential as a test data generator was also reviewed and formally presented. Each package was evaluated independently and then compared with all contenders for overall performance and price. Matrices, listing all requirements and assigning numeric values to each package according to its capabilities in meeting them, were compiled to assist users in their final decision.

Numerically, Applied Data Research, Inc.'s Meta Cobol scored higher than Easytrieve. After weighing costs and other factors, however, a consensus of users selected Easytrieve as the test data generator that best met our needs.

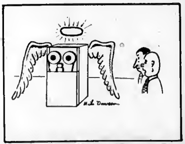
The logic behind the decision was simple. Easytrieve would cost us nothing, we already had good experience with the package, a basic training program had already been established in-house and Pansophic was providing good support. In addition, extra documentation was free, the package itself was very flexible and enhancements made to support IMS were due to be released by Pansophic in the near future.

The group concluded that three steps would be necessary to initiate and install Easytrieve as our test data generator. We needed to:

- Define and develop exit routines for additional output access modules.
- Develop a comprehensive training program for Business Systems Personnel on the capabilities and use of Easytrieve as a test data generator.
- Provide support for the training classes and encourage the support of Easytrieve as a test data generator.

The first two items will be completed by the Personnel Group in approximately three man-months. Item three is an ongoing responsibility of all business system managers.

Martin is programmer/analyst manager for the Personnel Systems Section of Brown & Root Business Systems, Houston, Texas.



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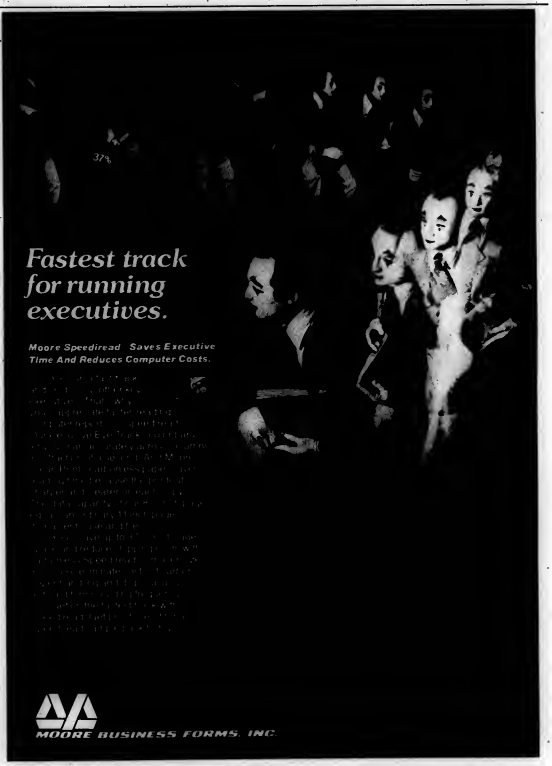
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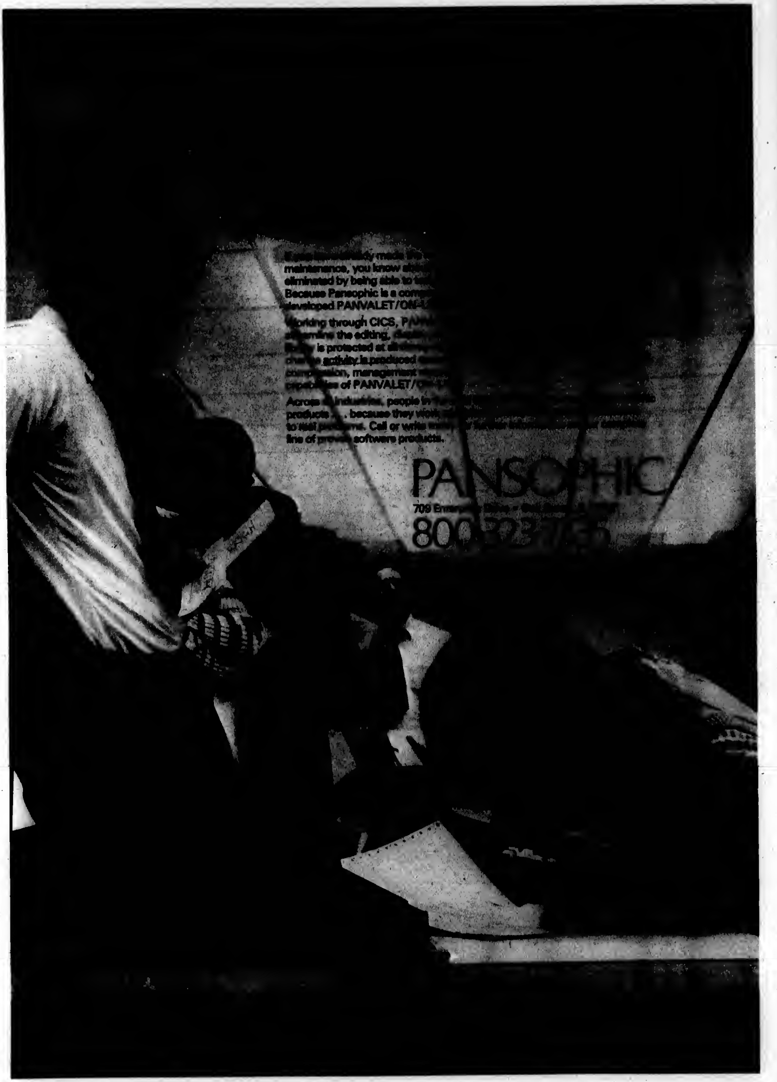
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Plessey Machines Emulate DEC 320s

By Jeffry Beeler
CW Staff

IRVINE, Calif. — Three of Plessey Peripheral Systems, Inc.'s existing small business systems have been combined with a previously unavailable software package to produce a family of enhanced configurations that reportedly emulate the Digital Equipment Corp. Datasystem 320 series.

In hardware, the members of the Plessey PM-Dsyst-1 line are identical to the existing Plessey Syst-1 systems, a series introduced a year ago and based on the DEC LSI-11.

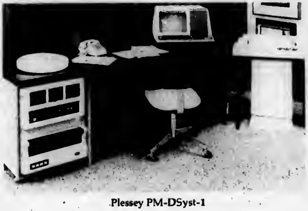
Unlike their older Plessey relatives, however, the three PM-DSyst-1s use a disk-based operating system that combines two software products Plessey previously offered only as separate modules. Dubbed PCS-001, the operating software consists of a Dibol compiler and a time-sharing monitor that supports any RT-11 programming language, according to a Plessey spokesman.

By adding PCS-001 to the A, B and C models of Syst-1 family, the company has formed a 320-compatible version of each of those systems, the official explained.

One of these versions — the DSyst-1A — replaces the Datasystem 322 and, like the Syst-1A, incorporates a floppy disk unit. The other two systems — the DSyst-1B and DSyst-1C — replace the Datasystem 324 and, like their Syst-1 counterparts, use 5M-byte front-loaded and 10M-byte top-loaded cartridge disk units, respectively.

Among their performance advantages over their DEC rivals, the

(Continued on Page 44)



Plessey PM-DSyst-1

Vendor Official Predicts

Rapid Advances Await Mini Software

By Tim Scannell
CW Staff

BOSTON — Rapid technological changes will soon sweep the minicomputer software field — much as they already have the hardware sector — and in so doing will narrow the performance differences that have traditionally separated mainframes from small systems.

That prediction was made here recently by William Foster, Data General Corp.'s director of software development. Speaking at the formal announcement of five DG software support products [CW, July 24], Foster noted that in the past minicomputer software has lagged far behind minicomputer hardware in technological sophistication.

In coming years, however, a profusion of new programming languages, operating systems and application development tools promises to restore software to rough technological parity with hardware, he forecast.

If the expected advances do not take place, Foster warned, "the gap between technologically advanced hardware and underdeveloped software . . . will slow computer users to a crawl."

Foster characterized software as "the personality of the computer system" and stressed that "hardware advances must be met by software advances to promote balanced, functional computing resources." There is now a greater need than ever before for hardware and software resources that "promote easy access to both interactive and batch processing" and at the same time "hold the line on runaway costs."

'Total Systems' Picture

The software state of the art has undergone few breakthroughs, Foster observed, because most software improvements stemmed from advances in hardware technology. The evolution of modular software packages, for example, resulted from faster logic families and lower memory costs.

Users, however, are no longer enthralled by elaborate and eye-catching hardware. They are now looking at the "total systems" picture, which includes both hardware and software, in deciding whether to purchase a system, Foster continued.

Systems costs are sometimes given secondary consideration by applications-oriented firms. "Although users are attracted to computers when they hear hardware costs have steadily decreased over time, they are giving a hard look at the software end of the system equation," Foster said.

In fact, he remarked, "software is not only assuming the role as the deciding factor in system purchase decisions, it is also the gating factor in the continued price/performance and — more importantly — the price/functionality edge the minicomputer vendor has delivered in the past."

Minicomputer operating systems form the foundation upon which software components, such as application languages and development tools, are built, Foster stated. The best operating system is structured to accommodate additional sophisticated software modules.

"Without such an operating system, the languages and applications development tools will suffer in terms of functionality," he claimed.

Commercial DP is quickly becoming the proving ground for minicomputers as more and more

(Continued on Page 44)

Mini Bits

HP Branch Moves, Gets Name Change

FT. COLLINS, Colo. — Hewlett-Packard Co. has changed the name of its Calculator Products Division to the Desktop Computer Division (DCD).

Announcement of the name change coincided with the relocation of the division's manufacturing and administrative facilities in nearby Loveland to a 340,000 sq-ft complex here.

HP renamed the eight-year-old division to reflect the changing nature of its product line, which has evolved from programmable calculators to processors rivaling minicomputers in performance, according to DCD marketing manager Fred Bode.

'Album' Details Peripherals

NORTHBORO, Mass. — A brochure in LP record album format describes the Digital Equipment Corp.'s RX01, RL01, RK07, RM02/RM03 and RP06 storage peripherals.

Entitled "Discourse," the 16-page "album" covers the five systems' storage capacity, performance, data integrity and reliability/maintainability, according to DEC officials.

Brochure EA 90536 is available from DEC's Printing and Circulation Services at 444 Whitney St., Northboro, Mass. 01532.

PDP-11 Add-On Memory Stores 128K on One Board

WALTHAM, Mass. — Up to 128K by 18 bits of MOS storage are now available to users of Digital Equipment Corp.'s PDP-11 family following Cambridge Memories, Inc.'s (CMI) introduction of a single-board add-on with 16K random-access memories.

Also packaged in 16K, 32K, 64K and 96K versions, Superstor-11 provides hardware and software compatibility with the PDP-11/04, PDP-11/05, PDP-11/34, PDP-11/35, PDP-11/40, PDP-11/45, PDP-11/55 and PDP-11/60, according to CMI officials.

The product fits in any hex slot with a Unibus or modified Unibus on the A and B connectors.

Features available with the add-on memory include 16K block substitution, parity LED, power-check LED and 3-bit page assignment register.

If a hard error occurs in any of Superstor-11's 16K memory blocks, the substitution feature reportedly allows users to bypass the defective area with jumper lines and continue using the remaining memory blocks.

The parity LED immediately signals the presence of parity errors either in the memory or elsewhere in the system, while the power-check LED helps locate system malfunctions by indicating when the memory is receiving the required power.

The page-assignment register, meanwhile, allows users to selectively enable or disable memory through manual, remote or software control, they added.

Described as a supplement to the manual address-selection switches used to set Superstor-11's address range, the register lets users put up to 1M byte by 18 bits of main memory on-line through software control.

Address bits 0 through 18 provide contiguous addressing from 0 to 128K words with address bit 0 used to control the write byte.

In OEM quantitites, a 128K-byte by 18-bit Superstor-11 costs about $6,000 from CMI at 360 Second Ave., Waltham, Mass. 02154.

NCR Adds Interactive System For Heat, Plumbing Firms

DAYTON, Ohio — Tailored to plumbing, heating and air-conditioning equipment suppliers earning $500,000 to $2.5 million annually, a direct processing system from NCR Corp. is said to minimize data entry errors by being interactive.

On a CRT terminal, the I-8150 displays data as it is entered, then immediately verifies the input and automatically updates the user's files.

Most other systems in its price class gather data in long serial lists or batches and run it through the processor at specified intervals, NCR spokesmen explained.

The I-8150 offers three software modules. The first oversees order entry, including editing and validating, and reviews and updates customer status and inventory levels.

The second module ensures real-time inventory management and helps produce stock analysis reports that show profitability, year-to-date usage trends and annual usage trends, NCR officials said.

With NCR's accounts receivable and other general accounting packages, the I-8150 incorporates a 64K-byte CPU, 4.9M-byte disk unit and 50 line/min printer.

Such a hardware configuration costs $24,760 and rents for $723/mo under a five-year contract. System software, which will become available in August, costs $3,495 under a one-time license fee or $105/mo.

Both the hardware and software are available from NCR in Dayton, Ohio 45479.

Micro-Based Business Unit Integrates Intelligent CRT

CUPERTINO, Calif. — Intelligent terminal and general-purpose computing capabilities are said to be combined in one enclosure with Zilog, Inc.'s latest microcomputer-based business system.

Described as the company's first system to provide an integrated intelligent terminal, the MCZ-1/60 incorporates a CRT terminal with 4K bytes of random-access memory (RAM) expandable to 52K bytes and a CPU with 32K bytes of RAM expandable to 64K bytes.

The system also incorporates dual, rack-mounted floppy disk units that store 600K bytes.

Software support includes Zilog's RIO operating system, which accommodates Cobol, PLZ, Basic and Fortran IV. Application programs allow the system to perform tasks like order entry, accounts receivable, payroll and mortgage loan accounting.

The MCZ-1/60's intelligent terminal incorporates a 9-in. CRT monitor that displays 1,920 characters and graphics, a detached keyboard with 128 Ascii upper and lower case characters, 10-key numeric pad and 13 user-definable function keys.

Other features include dual Zilog Z80-MCB microcomputer boards, Z80-MDC memory disk controller board, Z-80VDB CRT board and six open chassis slots for additional I/O expansion.

The MCZ-1/60, which also comes with desktop disk systems in a version designated the MCZ-1/62, costs $6,990 from Zilog at 10460 Bubb Road, Cupertino, Calif. 95014.

Three Plessey Systems Get DEC 320 Compatibility

(Continued from Page 43)

DSyst-1 systems typically accommodate up to four terminals simultaneously, the Plessey spokesman noted.

By contrast, the Datasystem 320 series, although theoretically capable of the same user support, has a practical limit of only two simultaneously operating terminals, according to the official, who claimed to base his conclusion on conversations with users of the DEC equipment.

The spokesman attributed the Plessey systems' support capability to the design of the family's time-sharing monitor, which permits the 320 replacements to swap their operating system between disk and main memory as needed.

The Plessey official also credited the DSyst-1 systems with costing less than their DEC counterparts. A Model B system with a 10M-byte cartridge disk unit, for example, costs almost $4,000 less than a similarly configured Datasystem 324, the spokesman's price quotes suggested.

Among their other competitive advantages, the Plessey systems reportedly support Fortran, Basic and Macro-11 as well as Dibol, whereas the Datasystem 320 accommodates only Dibol, DEC's version of Cobol.

In addition, the DSyst-1 family provides automatic spooling and an optional sorting program up to 20 times faster than its DEC equivalent, the spokesman claimed.

Configurations, Options

All three models in the 320-replacement line incorporate a Plessey Micro-1 CPU with an LSI-11 and 64K bytes of nonexpandable MOS memory. They also provide a PCS-001 license; choice of 1,920-character CRT terminal or 30 char./line hard-copy terminal; and an optional 45 char./sec or 300 line/min printer.

The Model A, however, uses the company's 512K-byte PM-XSV11/B dual floppy disk unit, while a basic Model B provides two 2.5M-byte PM-OSV11/B cartridge disk subsystems expandable to 10M bytes. A basic Model C, meanwhile, incorporates four 2.5M-byte PM-DSV11/C cartridge disk subsystems expandable to 20M bytes.

Starting from a basic Model A system, users can reportedly upgrade to the maximum DSyst-1 configuration without rewriting software or changing peripherals.

Although the PM-DSV11/C subsystem typically rotates at 1,500 rev/min, the upward-compatible business systems also offer an optional 2,400 rev/min version of that mass storage unit.

The floppy disk subsystem uses 8-in. recording media and accesses in an average of less than 1 sec, while the CRT terminals transmit up to 9,600 bit/sec. The optional printers output 132-column lines with pinfeed form handling.

A typical DSyst-1 configuration with a 64K-byte CPU, 10M-byte cartridge disk subsystem, operating software and one DEC VT52 or VT100 CRT terminal costs $15,690. With a 5M-byte subsystem, that configuration costs $14,900 from Plessey at 17466 Daimler, Irvine, Calif. 92714.

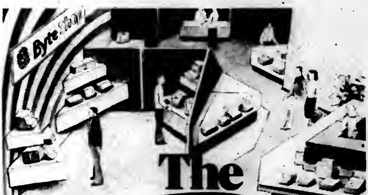
Rapid Advances Await Software

(Continued from Page 43)

managers turn to nontechnically oriented people on their staff to operate the system and produce answers. The computer, through software interaction, must not only offer a high degree of security and integrity, but also a certain amount of "approachability."

Software systems should ideally provide a simplified form of inputting data and an uncomplicated method of accessing processed data.

Standard, proven languages and utilities not only allow managers to call upon the resources of nontechnical people, but they actually "reduce the total systems cost and increase the efficiency of the computer and its users," he commented. "Such software promotes transportability between systems, which reduces system conversion efforts and also contributes to holding the line on runaway costs."



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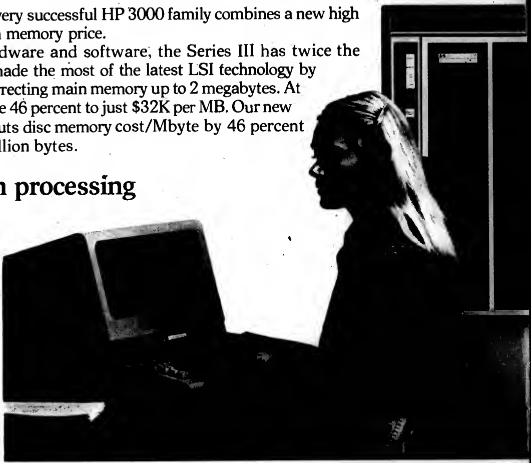

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MPE III also gives you some features previously found only on expensive mainframes. Multipoint terminal support is one. You can also cut your communications costs substantially by hooking up a string of terminals on a single cable, with a 9600 baud line speed.

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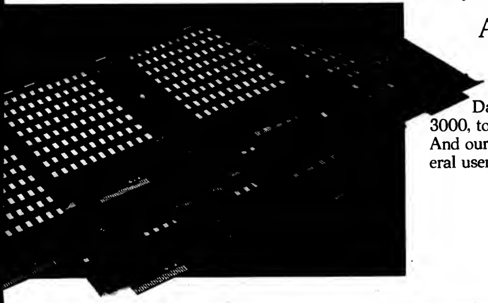

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While we're making it easier to use the HP 3000, we still want to give you all the personal help we can. So we've added a number of consultants in on-line transaction processing and manufacturing to our field force. They'll help you through the critical first phase of planning and installation.

A new feature of DS/3000, our networking software, gives you easy access to remote data bases. For a large company, this can obviously lead to a much more efficient distribution of data, as well as making management information even more speedily available than before.

With all these advantages, and system prices starting at $115,000, don't you owe yourself a closer look? Call your nearest HP office listed in the White Pages and ask about a hands-on demonstration of the powerful Series III, the new head of HP's business systems family. Or write to Hewlett-Packard, Attn: Bill Krause, Dept. 029, 11000 Wolfe Road, Cupertino CA 95014.

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System Warns Early of 'Post-Op' Problems

ATLANTA — The chances that patients will survive the sometimes serious complications of open-heart surgery have improved at a local hospital that recently equipped its cardiac referral center with a minicomputer-based patient monitoring system.

Capable of simultaneously handling up to 32 cardiac care patients, the system periodically samples eight vital signs — some of them, like heart rate, as often as every 30 seconds — and outputs the results as a graphics display or hard copy.

In seconds, the system also charts trends in those vital signs and evaluates a patient's medical status. With this information, which a minicomputer can supply far faster than a human, doctors and nurses at the Crawford Long Hospital can spot a patient's post-operative complications in their early stages and treat them before they become life-threatening.

The system also monitors patients in the hospital's respiratory and renal intensive care units (ICU).

Speedy Recognition

To illustrate the value of a computerized monitoring system, thoracic surgeon Dr. Joe Miller cited the case of a patient who began to bleed internally some six hours after undergoing an operation. The system promptly recognized the problem and within 45 minutes doctors had wheeled the patient back into an operating room to stop the bleeding.

"With manual procedures — checking the patient's blood pressure every 15 minutes and checking the amount of blood draining out of the chest drainage tubes — it probably would have been four hours before it could be determined that something was wrong," Miller noted.

Before it acquired the current system, Crawford Long maintained only an eight-bed ICU. But when the hospital received a grant to modernize its cardiac referral center, planners decided to automate the institution's patient monitoring system.

They accomplished this by installing a Hewlett-Packard Co. 5600A system built around a 32K-byte 2100 minicomputer with an HP 7900A dual-disk unit, analog-to-digital converters, paper tape and punch unit, three HP 2640A interactive CRT terminals and four HP Option X72 bedside graphics terminals.

The 5600A monitors patients with the help of a series of Fortran applications programs, and its systems software operates as a subset of HP's Real-Time Executive Operating System.

Question of Time

Noting the forces that prompted the hospital to install the system, Crawford Long's bioengineering director Robert Harbort recalled, "We wanted to expand [our intensive care program] to cardiac surgery and respiratory and renal intensive care. Without a computer it would have required a significant increase in staff to manually collect information on the increased number of patients.

"For instance," Harbort continued, "the computer checks heart rates every 30 seconds. It takes a nurse at least a minute to take a pulse and record it, and no human can construct trend plots or perform analyses in a second."

In addition to speeding assessment of patients' medical conditions, the system performs services previously unavailable to the Crawford Long staff. For example, it generates a patient's medical records in a format tailored to the specialty of the physician who will use it.

Crawford Long officials also credit the system with easing the pressures on the hospital's critical-care nurses. "Before, there would often be a 15- to 30-minute wait between the checking of vital signs, so there was a higher probability of missing a change in patient status with the manual system," clinical nurse specialist Carole Gassert said. "The computer monitoring shows us at a glance if things have changed."

Patient Histories Tracked

Among its other advantages, the system allows hospital personnel to recall a patient's past vital signs on a CRT terminal at the individual's bedside or at the institution's central nursing station.

For example, by entering the patient's identification number on a terminal keyboard and specifying the desired output format and period, a nurse can request a display of the individual's vital signs at 8 p.m. yesterday; trend plots of the patient's heart rate and temperature for the past three days; minimum and maximum vital signs between 6 and 9 p.m.; and other information.

"The instant recall capability allows the nurse to look back at a situation and see what precipitated it," Gassert explained.

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Charles River Data Offers DEC-Replacement Floppy

NATICK, Mass. — A floppy disk system that incorporates the Digital Equipment Corp. LSI-11/2 microcomputer and associated plug-in memory reportedly replaces its DEC counterpart, the PDP-11V03.

Charles River Data Systems, Inc.'s MF-11/2 incorporates two Shugart Associates, Inc. floppy disk systems with controller, power supply, slides for rack mounting and DEC H9270 backpanel as well as the DEC processor in its 10.5-in. enclosure.

A controller and interface card is said to ensure software and media compatibility between the processor and the floppy disk system, which accepts any PDP-11V03 software package.

A typical MF-11/2 configuration with a 16K-byte DEC memory costs $5,130 from the company at 4 Tech Circle, Natick, Mass. 01760.

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MPU Uncovers Auto Ills

'Machine Is Mechanic' at Tune-Up Shop

By Ann Dooley
CW Staff

NATICK, Mass. — "A machine is the mechanic" at the Tuner Up Service Center here, according to operations manager Dick Jones. The machine is a 4K-byte microcomputer that helps diagnose an auto's ills before human mechanics tune and repair the car.

"We let the micro make the decisions and tell us what needs to be done," Jones said. "We rely on it entirely, even above our own instincts." The reason for this, he explained, is that the computer is "so much more precise than a mechanic and can narrow down a problem to the exact degree."

Jones said the response to the computerized tune-up service has been tremendous: "The customers are floored by it, but they love it."

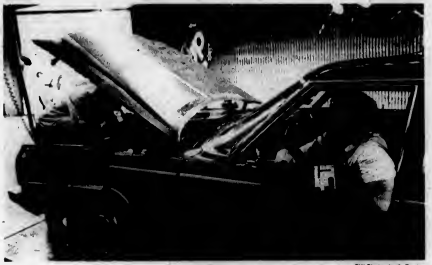
Tuner Up uses a Hamilton Test System microcomputer designed especially for its "autosense" system. The micro checks 80 key engine specifications and determines in about three minutes how closely each matches those of a car when it came out of the factory. It then provides a hard copy of the results.

The system is programmed to handle almost any make or model of car, Jones noted.

The Tuner Up system eliminates any mistakes by mechanics; many customers trust its findings more than a mechanic's since they consider the computer to be impartial, Jones said.

If the customer decides to have Tuner Up mechanics tune the car, the car is run through the computer analysis again after the work has been completed, and a second printout is generated to show whether the faulty areas were corrected. If the car still doesn't test within performance parameters in some way, the mechanic works on it further until the problem is corrected, Jones said.

Any major repairs are done elsewhere since the main function of Tuner Up Service Center is to analyze what needs to be done and then tune the engine.



CW Photos by A. Dooley

Dick Jones uses portable CRT/keyboard to check out a car (above), then shows owner Marianne Stapleton what parts failed to meet the proper specifications.

Among the parts tested in the tune-up analysis are the battery, starter, points, spark plugs, timing, carburetor and distributor. The printout identifies the car being tested, the types of tests conducted, the conditions tested, the specified low and high operating parameters and the results of the tests.

The system is self-calibrating; each morning before work begins at the service center, it runs a check on its circuitry in order to match its numbers with the fixed specification numbers. "We've never had any problem with the system, but if anything did go wrong, it would go wrong by such a large amount it would be an obvious mistake," Jones said.

The auto analysis begins when the make, model number, number of cylinders and other pertinent information about a specific car is entered into the computer via a handheld CRT keyboard. Sensors are attached to the car's engine and exhaust system and the ignition is turned on.

The computer is programmed to load in the specification limits for each particular car and run a number of sequence tests on it. The sensors transmit how the car is running and the system compares it with the proper specifications.

A general health program indicates what

(Continued on Page 50)

CDI Has Development Terminal For Users of Motorola 6800

BURLINGTON, Mass. — Computer Devices, Inc. (CDI) has introduced a microprocessor development terminal for the Motorola 6800 microprocessor user.

The Miniterm Model 1204 offers a built-in minicassette tape transport with 68,000 characters of removable storage capacity, as well as an integral 8K random-access memory (RAM) expandable to 32K.

CDI Miniterm Model 1204

The unit features a full 128-character Ascii keyboard, 35 char./sec thermal printer, switch-selectable Ascii or binary code and horizontal and vertical tabbing.

The Model 1204 includes off-line program preparation with full text editing, debugging aides and a file management capability. CDI provides a preformatted assembler tape and program conversion tape to allow source programs written in Motorola 6800 Assembly langauge to be edited, loaded and executed within the same unit.

The user-programmable Miniterm 1204 costs $3,985 from CDI at P.O. Box 421, 25 North Ave., Burlington, Mass. 01803.

Tektronix Planning Workshops With Emphasis on Software

BEAVERTON, Ore. — Tektronix, Inc. will offer at various locations around the country a workshop in microprocessor design with an emphasis on software development and system integration.

Depending on the date, the course is structured toward either the design engineer or the engineering manager who wants to understand microprocessor product design techniques starting from early development to prototype software/hardware integration.

The workshops are scheduled through November and are limited to 12 attendees. Each lasts four and a half days, from Monday to Friday.

The eastern area workshops will be held in Rockville, Md., Woodbridge, N.J., Atlanta and Boston. Western workshops will be held in Santa Clara, Calif., Dallas, Chicago and Los Angeles.

Each session will combine lectures, problem solving and hands-on use of microprocessor development aids. Elements of programming, program development, program debugging, prototype testing and real-time emulation will be discussed.

The workshop fee is $595. Information on the dates of the workshops is available from Tektronix, P.O. Box 500, Beaverton, Ore. 97077.

$30 Wire-Wrap Board Eases Prototype 'Glitches'

LINCOLNWOOD, Ill. — Research Technology, Inc. is offering microcomputer users a wire-wrap montage board designed to eliminate "glitches" in prototyping dedicated microprocessor-based systems.

The combination of distributed parallel matrix power and ground planes with a chip bypass capacitor provision reduces the power bus glitch problem found in wire-wrap circuits and also saves wire-wrap time, the firm claimed.

Like SBC 80/04

Described as similar to the Intel Corp. SBC 80/04 board in its dimensions and edge connection, the G-10 glass epoxy board has double-sided solder plating with plated-through holes.

The board will accommodate 41 14-pin or 16-pin integrated circuits (IC) or up to four 20-pin or 24-pin ICs.

The board also provides a 50-pin, .100-in. spacing gold edge connector.

Flat wire dip connectors may also be used, the company said.

The board costs $30 with a minimum order of 10.

Research Technology is located at 4700 Chase Ave., Lincolnwood, Ill. 60646.

Tech Ex '79 Set for Atlanta

ATLANTA — The Annual World Fair for Technology Exchange (Tech Ex '79) will be held at the Georgia World Congress Center here, Feb. 27-March 2.

Tech Ex will provide representatives of industry, government, universities and research and development organizations with the chance to exchange technology as well as the experience and knowledge of product development, joint ventures, acquisitions and licensing.

The fair will also feature an "Inventors Corner," where inventors can display their patented developments.

The fair will provide the technology and engineering know-how for the manufacturing and marketing of inventions and innovations, according to its sponsor, Dr. Dvorkovitz & Associates, P.O. Box 1748, Ormond Beach, Fla. 32074.

Objective Has Prom Boards

TALLAHASSEE, Fla. — Objective Design, Inc. has unveiled a programmable read-only memory (Prom) programming and storage board that holds a maximum of eight Texas Instruments, Inc. TMS 2716 or 2708 Proms.

The Databank will program Proms via two special sockets, one of which provides a connection to an external programming station. The other allows the programming of Proms on the Databank.

The Databank will also hold 1K or 2K bytes of 2114 random-access memory (RAM) which operates as bus memory or can be substituted by software commands for any of the Proms, the firm said.

The board is available in kit form. The Databank Model DB00 with no RAM costs $199.95; the DB08 with 1K RAM costs $219.95; and the DB16 and 2K RAM costs $239.95 from Objective Design, P.O. Box 20325, Tallahassee, Fla. 32304.

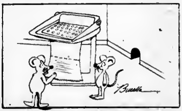
MPU Finds Car Troubles

(Continued from Page 49)

overall problems the car may have in addition to the programs that run specific tests for specific automobiles.

The system is based on a 4K microcomputer expandable to 8K. Tape cassettes are used to store the vehicle specifications and programs. A small printer, the handheld CRT keyboard and the sensors that are physically attached to the car round out the system.

Tuner Up also uses a Data Terminal Systems, Inc. Series 400 system for inventory control. Each part that is used in a tuneup or sold individually is entered into the data base. an analysis of all the parts used each week is generated on tape. More than 480 parts have been coded and their prices placed into the system, which can be updated as new parts are added or costs changed.



'It Says, "Only an 18% Chance of the Cat Coming Around Today." '

DOING BIG THINGS WITH SMALL SYSTEMS

A Special Report on Minicomputers and Small Business Systems in the August 28th Computerworld.

As small computer systems have become less and less expensive, the question has changed from "whether to buy" to "how to apply". A furniture store in L.A. found a mini worthwhile in cutting its delinquent accounts, while a survey company in England is using a mini on board to help locate North Sea oil reserves. And as the price tag on small business systems continues to drop, their applications will increase geometrically.

In our August 28th Special Report, we'll be taking a closer look at the profits (and pitfalls) of mini-using. Featuring a series of applications and tutorial stories, this supplement will examine how others have solved their mini problems, and will include tips from vendors. It will cover topics like:

- *Use of small computers in large system hierarchies*
- *Minicomputers as software development tools*
- *How to select a printer for mini systems*
- *Future developments in disk systems design*
- *Maintenance of magnetic storage media*

If you're interested in new ways to increase efficiency and cut costs in your business operations, don't miss this *Computerworld* Special Report. And if you are a manufacturer or dealer in minicomputer equipment, your ad should be there. Closing date is August 11th. Call your *Computerworld* salesman for more information and complete assistance in ad planning. Or, to place an ad, call Terry Williams at (617) 965-5800.

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As Quarter Results Come In

IBM Lags in Earnings, Revenues Races

With second-quarter earnings and revenues now in for most mainframe computer makers, IBM is lagging behind the others in terms of the earnings and revenues percent increases.

IBM's paltry 5% gain in earnings garnered it last place among the six firms reporting, with Amdahl Corp. posting an 89% increase in earnings on a 64% revenue jump, Control Data Corp. jumping 254% in computer-related earnings, Honeywell, ahead 49% and NCR Corp. up 44% in the earnings race.

"Purchases of data processing equipment were somewhat higher in the quarter and for the six months than in the comparable periods of 1977. This reflects the tapering off of purchases of 370 Models 158 and 168 and increasing shipments and purchases of newer products," IBM Chairman Frank T. Cary explained.

"The worldwide buildup of resources to meet the strong demand for these new products, together with inflationary pressures, continued to impact costs and expenses during the second quarter. As a result, earnings for the quarter and six months show relatively modest gains from the comparable 1977 periods," Cary continued.

IBM posted second-quarter revenues of $4.9 billion and earnings of $691 million or $4.73 a share. Second-quarter revenues for 1977 were $4.4 billion, with earnings of $658 million or $4.44 a share.

Amdahl Tops $73 Million

Amdahl Corp.'s revenues for the second quarter topped $73.9 million compared with $45 million in the comparable 1977 period.

Earnings dashed ahead to $11 million or 66 cents a share compared with year-ago results of $5.8 million or 38 cents a share (1977 earnings were restated for a two-for-one stock split and were shown before an extraordinary credit of $5.1 million).

"Margins improved despite startup costs incurred during the second quarter to bring on-line new facilities in California and Ireland," John C. Lewis, Amdahl president, noted.

CDC Earns 254% More

CDC's second-quarter earnings from computer operations jumped 254% from the same period a year ago, reaching $12.3 million from $4.8 million.

Revenues from computer business for the two periods were $449.1 million and $369.7 million, respectively, with rental and service revenues accounting for slightly over 50% for the quarters in both years.

Consolidated earnings from CDC's computer operations and Commercial Credit Co. totaled $25.4 million or $1.48 a share for the second quarter, a 49% increase from last year's second-quarter earnings of $17.1 million or 99 cents a share.

CDC's chairman and chief executive officer, William C. Norris, said "it is very likely the second quarter will be our strongest quarter because of the volume of OEM business and the timing of shipments of larger computers, and this may have a moderating effect on third- and fourth-quarter results."

Honeywell, Inc.'s second-quarter earnings were up 49% from second-quarter 1977 and revenues climbed 22%. Quarter earnings from all operations were $44 million or $2.06 a share compared with $29.6 million or $1.41 per share in the same period a year ago.

Revenues from all operations for the second quarter were $862.7 million compared with $705.9 million in last year's period.

Complete figures for computer-related business are not available on a quarterly basis. However, Honeywell reported $171.2 million in revenue from computer rental and

(Continued on Page 52)

Antitrust Commission Agrees To Hear AT&T Suggestions

By Edith Holmes

CW Washington Bureau

WASHINGTON, D.C. — AT&T requested and received a hearing by the National Commission for the Review of Antitrust Laws and Procedures as the commission began its study here of the problems in large and complicated antitrust trials.

The commission initially denied, but then was persuaded to approve the Bell System's wish to testify on the nature of the "protracted" case because of the corporation's experience in the antitrust suit the U.S. government has brought against it. The antitrust body agreed to hear AT&T's representative, attorney Harold Levy, only after reading his 75-page statement and "thinking about it overnight."

Only two of the commissioners — Maxwell Blecher, an attorney who practices law in California, and Rep. John F. Seiberling (D-Ohio) objected to Levy's appearance as "inappropriate." Blecher reminded the commission of its June 21 decision not to become "a forum for existing litigants to take potshots at their opponents."

The remaining 20 commissioners who voted to listen to Levy did so only with the instruction that he limit his comments to the handling of big cases.

While Commissioner Eleanor Fox expected to benefit from Levy's experience with massive antitrust cases, she said she was "distressed by the argumentative nature of his statement," particularly his comment that the government should never have filed the suit against AT&T. Fox agreed to listen to the lawyer as long as there was no discussion of the merits of U.S. vs. AT&T.

Several of the commissioners expressed the concern that they were opening the door to a whole new group of witnesses by allowing Levy to speak.

Six-Guns at the Door

When he appeared before the antitrust commission, Levy promised that, as in an Old West movie, he would leave his six-guns at the local sheriff's office and abide by the commission's direction that he not discuss U.S. vs. AT&T.

Making frequent reference to this "restriction," the AT&T attorney suggested the commission adopt procedural changes and alter the antitrust laws.

The changes he recommended — that a defendant which happens to be a company in a regulated industry be permitted to challenge the jurisdiction of a district court all the way to the Supreme Court, for example, and that Congress rather than the courts resolve large, structural antitrust cases — mirrored AT&T's own requests in its contests with the government.

Levy was highly critical of the Justice Department's Antitrust Division, arguing that its attorneys "should bear much of the

(Continued on Page 52)

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Interest in DEC Software Standards Strong

By Marcia Blumenthal
CW Staff

MISSOULA, Mont. — The membership drive for the newly formed Business Products Standards Association (BPSA) is receiving a phenomonal response, according to BPSA president Al Arvish. Within the first three weeks, he reported, BPSA has received about 65 inquiries, mostly from commercial products OEMs.

The main thrust of the association's activities is the standardization of application software used on Digital Equipment Corp. computers. Initially, BPSA will concentrate on standardizing the input and output modules for business application software.

The idea for the association grew out of discussions at a meeting of Decus (the DEC users group) in San Diego last fall. Managers at DEC were invited to participate as soon as BPSA founding members decided to go ahead with the idea, according to Fred Shirley, technical manager of DEC's Market Development Group for Commercial Systems.

In explaining the need for BPSA, Arvish said, "a lot of applications packages around the country use different input modules, so when customers go from an accounts payable to accounts receivable package, what they see on the screen may be totally different. What we are trying to do is standardize the input module so it is easier for our customers to look at the screen and know what to do."

While the initial task of the group is to standardize software, longer range plans include regular educational programs and a joint large-scale project individual members could not afford to carry out separately.

In keeping with this educational goal, BPSA will hold a special conference in Toronto on Aug. 25-26. At that time, Larry Welke, president of International Computer Programs, Inc., will provide instruction on marketing software.

DEC fully supports the objectives of BPSA and will send instructors to the various training sessions planned by the association, Shirley said.

For longer range ventures, Arvish anticipated association members contribuitng capital towards developing large-scale projects. With combined capital, Arvish said, BPSA could, for example, develop a complete software package for the banking industry.

DEC's reaction to the formation of BPSA has been positive. Shirley views the venture as a means for members to capitalize on each other's strengths.

"With the enhanced transferability of software between suppliers, these OEMs will have more time to spend developing their businesses," Shirley concluded.

IBM Dragging in Quarter Results

(Continued from Page 51)

service for the second quarter compared with $149 million in the year-ago quarter.

"All major segments of Honeywell's business contributed to the company's strong performance," according to Edson W. Spencer, chairman and chief executive officer. "Computer revenues and operating profit continued to improve. Computer orders and backlogs increased substantially. Orders for minicomputers and large systems were particularly strong."

Honeywell expects to complete the acquisition in August of Spectronics, Inc., a manufacturer of optoelectric and fiber optic systems and components, Spencer noted.

The firm recently increased its quarterly dividend on common stock to 55 cents a share from the 47.5 cents in effect since August 1977.

NCR posted a 44% increase in earnings from continuing operations for the second quarter and a 7% increase in revenues compared with the 1977 period.

Second-quarter earnings totaled $39.8 million or $1.41 a share, up from $27.7 million or $1 a share a year ago, while revenues were $614 million compared with $575.5 million.

These earnings do not reflect the income from operations or gain on the disposal of the Appleton Papers Division.

"With the divestiture of our paper business, all of our assets and energies can be devoted to further expansion in the data processing systems market, which continues to offer exceptional potential worldwide," William S. Anderson, NCR chairman, said.

"Margins have improved substantially because of new, more cost-effective computer and data terminal products and economies achieved in the manufacture of earlier products. Lower interest expense and higher interest income also had a positive effect," he added.

Sperry Rand Corp. reported first quarter revenues of $972.5, up from $827.9 million for the first quarter a year ago. Earnings for the first quarter reached a record $45.2 million or $1.29 a share compared with first-quarter 1977 results of $37.5 million or $1.08 a share.

As of May 31, Univac logged slightly less than $1.5 billion in unfilled orders, up 22% from a year ago, according to J. Paul Lyet, chairman and chief executive officer.

The backlog for Univac's top-of-the-line 1100/80 computers has tripled from a year ago, Lyet added.

"We intend to continue our emphasis on computers by spending a disproportionate amount of our research and development money for this division," he said.

Antitrust Unit Hears Bell

(Continued from Page 51)

blame" for the delays in big cases.

While he said he checked his six-guns in before he began his testimony, Levy repeatedly revealed a Derringer hidden in his pocket, levying personal attacks at those commissioners who successfully challenged his recommendations or asked him to stop alluding to U.S. vs. AT&T.

Blecher, in particular, drew the attorney's fire when he asked how a case could be shortened if a defendant were allowed to challenge a district court's right to hear an antitrust case all the way through the judicial system. Levy maintained it would be more constructive than time-consuming to find out early whether the case should be tried in the courts at all.

Executive Corner

- David C. Malmberg has been elected to the board of directors of National Computer Systems, Inc.
- Richard D. Alman has been appointed vice-president of Western Union Teleprocessing, Inc. He will be responsible for planning marketing programs for the banking industry.
- David Ware has been named national sales manager for the Computer Services Division of Phoenix-Hecht, Inc.
- Donn Tatum, John F. Hughes and William C. May have been added to the board of directors at Western Digital Corp.
- John B. Scott has joined Teleprocessing Products, Inc. as executive vice-president.
- James Martin has joined the DMW Group, Inc. as chairman of the board.
- Robert E. Cook has been appointed vice-president of planning at Scientific Time-Sharing Corp.

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Paradyne Stock Goes Public To Enthusiastic Reception

LARGO, Fla. — Paradyne Corp. sold out its first public equity offering in less than an hour this month.

Listed on the over-the-counter market, Paradyne offered 894,698 shares at $10 each. Even though the number of shares in the issue was larger than expected and the price was 25% higher than planned, investors bought out the issue by 10:50 on July 11, the first morning of the public offering.

The original shareholders still retain about 70% of the outstanding shares.

Until now, the company has been financed by a group of sophisticated investors, according to George Pressly, vice-president of corporate planning. These investors realized there wasn't an unlimited source of private capital and have been eager to see the company go public, he said.

Approximately $6 million was raised from the public offering; the funds will be used to reduce bank debt and for operating capital, Pressly said.

Profitable Only Recently

Founded in 1969, Paradyne showed its first profit in 1976. Between 1975 and 1976 revenues grew approximately 30% from $7.7 million to $10 million. In 1976, Paradyne reaped a $516,000 profit.

In fiscal 1977, Paradyne's revenues grew 50% over 1976 results, reaching $15 million with earnings before taxes of $1.5 million. The company anticipates retaining the 10% income before taxes to revenues ratio in the future.

Noting the firm's rocky start, Wall Street observers pointed out that Paradyne is one of the few companies which has been able to raise money successfully in the public equity market.

Last year, according to statistics from "Investment Dealers Digest," manufacturing companies raised only $800 million through public sales of stock; with less than $300 million raised by privately owned companies like Paradyne going public.

This year only about 20 private companies have sold stock publicly, realizing about $40 million, the digest noted. The companies most successful in floating stock issues this year are small concerns which are perceived by investors as having high growth prospects and a well-established market niche.

Paradyne's niche is telecommunications equipment, with modems accounting for about 60% of its 1977 revenues.

CI Notes

Harris Breaks Ground For Fla. Headquarters

MELBOURNE, Fla. — Noting the official start of construction of Harris Corp.'s new headquarters here, Florida Gov. Reubin Askew said Harris has become Florida's largest industrial employer.

The company will invest $10 million in building, equipping and furnishing the three-building corporate headquarters complex on 30 acres of land, according to Harris President Joseph A. Boyd.

Harris, an $850 million-a-year producer of communications and information-handling equipment, decided last year to move its headquarters from Cleveland to Melbourne because "the Melbourne area has become the center of gravity for our worldwide business in terms of electronics research and development, employment and manufacturing facilities," Boyd said.

Harris, according to the governor, now has 10 electronics divisions based in Florida and employing 8,100 people, up 35% from three years ago.

The company anticipates moving its 100 headquarters employees and all corporate records from Cleveland on the weekend of Aug. 19. Until the office is completed in early 1979, the firm will occupy leased facilities in Melbourne.

Iranian Joint Venture Established by Univac

BLUE BELL, Pa. — Univac has formed a joint venture company in Iran which is chartered to market and service the complete range of its computer systems, data entry equipment and communications terminals.

The majority interest in Univac Iran, the company reported, is held by Abdol-Majid Aalam, chairman of the venture and Ahmed Vahabzadeh, director. Both men are prominent in Iranian business.

The establishment of joint ventures with partners who have strong local identities has, according to Univac, been a successful business strategy.

Univac also has joint ventures in the Scandinavian countries and Japan.

DPMA Reports 60 Booths Reserved For New Orleans

PARK RIDGE, Ill. — The Data Processing Management Association (DPMA) reported that a total of 60 booths have been reserved to date for the exhibition held in conjunction with the 1978 International Data Processing Conference, which is set for the New Orleans Hilton Hotel Oct. 29-Nov. 1.

Among the exhibitors already signed up are IBM, Texas Instruments, Inc., Boeing Computer Services, Inc., Quantor Corp. and Sycor, Inc.

Exhibit information is available from Angie Douglas, exhibits manager, DPMA International, 505 Busse Highway, Park Ridge, Ill. 60068.

Calma to Go Independent

KANSAS CITY, Mo. — United Computing Systems, Inc. (UCS) has announced plans for Calma Co. to become an independent operating division once the acquisition of Calma by UCS' parent company, United Telecommunications, Inc., is completed.

United Telecom and Calma recently signed a definitive agreement for United Telecom to acquire Calma. The agreement is subject to the approval of Calma stockholders.

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PROGRAMMERS

Children's Hospital Medical Center has immediate openings for Applications programmers. Successful candidates must have a minimum of 2 years' experience in business applications with COBOL and IBM DOS/VS. CICS experience a plus.

Salary commensurate with experience. Excellent benefits package including **3 WEEKS VACATION** the first year.

Interested applicants please send resume to Pamela Williams, Personnel Department, 300 Longwood Ave., Boston, MA 02115.

children's HOSPITAL MEDICAL CENTER

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Systems Analyst

Excellent opportunity in New Mexico's high country for a self-starting creative individual. This highly visible position will be responsible for designing and implementing a modern on-line interactive financial management system.

For further information on how you can make full use of your ability and experience submit your resume or place a call to: Administrative Services Dept.

Los Alamos County
P.O. Box 30
Los Alamos, NM 87544
(505) 662-4122, X45
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PROGRAMMER ANALYSTS

We are looking for data processing professionals to meet the demands of expansion in our St. Louis headquarters Business Systems Services programming staff. These positions provide the means to advance your career in a true state-of-the-art computer environment. Our IBM 3033 and Polyplex IBM 370/168, processing diversified batch, on-line, data base and RJE applications, offer the opportunity to put your talents to work using the latest in programming languages, techniques and software systems.

Qualified applicants should have experience in business applications programming, using COBOL or PL-1 and JCL on IBM 360/370 equipment running on OS and MVT/MVS. IMS applications experience especially desirable.

Systems programming positions also available in support of a Multi-CPV complex using ASP/MVP large JES 3/VS and VM.

CDC systems programmer positions available with CDC CYBER KRONOS/NOS experience.

Send your resume including salary history in confidence to:

W. B. Kellenberger
Section Manager.
Professional Employment
Department CW-07-2
P.O. Box 516
St. Louis, Missouri 63166

MCAUTO

Senior Engineer Performance Analysis

We are seeking an aggressive individual who will search out performance analysis opportunities in the company and plan, organize, lead, and control the resulting projects. The emphasis will be on applied performance studies with some performance tool development. These studies will involve experimental design setup, data collection via hardware/software monitors, and data reduction and analysis. They will be directed toward architectural design and operating system analysis, including research on computer performance analysis techniques.

In addition to a PhD in computer science or the equivalent, the qualified candidate will have a working knowledge of statistical experimental design (including multivariate statistics), hardware/software monitors for the PDP-11 and other mini-computers, and performance analysis of multi-processor systems. Familiarity with analytical and simulative modeling, operating system performance analysis, and programming on DECsystem 10 and PDP-11 system is required; specifically, programming in FORTRAN, COBOL, ALGOL, SNOBOL, and 11-Assembler.

Candidates interested in this position should send their resumes to Peggy Downing, Digital Equipment Corporation, 129 Parker Street, Maynard, Massachusetts 01754. We are an equal opportunity employer m/f.

digital

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Surfing! Fishing! Golfing! Tennis! Boating! and a great place to work!

City of San Diego is looking for experienced Systems Analysts to develop exciting and unusual applications systems.

Our police department is currently developing, designing and implementing a major Automated Regional Justice Information System for our county.

Analyst will be assigned to that project and to major personnel and water utility billing projects. If you can meet our standards, perhaps you will join our team. Send us your resume for evaluation.

Successful applicants will have the equivalent of a Bachelor's Degree and at least 2 yr. of experience in applications systems analysis, design, AND programming, using ANS COBOL in an environment similar to an IBM 370-168 utilizing OS/VS1, JCL,IMS/VS or other DB/DC system.

CITY OF
SAN DIEGO
Personnel
202 C St.
San Diego, CA. 92101
(714) 236-5560
Equal Opportunity Employer

COMPUTER SYSTEMS ANALYST
CITY OF GRAND JUNCTION
COLORADO

This position reports directly to the Data Processing Supervisor and is responsible for determining the feasibility of and development of new systems for City/County operations.

Requires Bachelor's degree in data processing, accounting, or related field plus 4 yrs. exp. as a programmer to include 2 yr. in systems analysis and 2 yr. supervisory exp.; data base and NCR on-line exp. preferred; NCR V-8550 on order; current data processing staff is 11.

City of Grand Junction serves a growing community of 53,622 and is situated on the Western Slope of Colorado.

A maximum starting salary of $1,292.00 per month is commensurate with qualifications and is supplemented with a comprehensive fringe benefit plan.

Send resume to Personnel Office, 250 N. 5th Street, Grand Junction, Colorado 81501, no later than Friday, August 11, 1978.

An Equal Opportunity Employer

SYSTEMS ANALYST
No. Carolina-$25K

A Fortune 500 mfg co, due to continued growth, has requested us to identify and recommend several systems professionals. Responsibilities will include design and analysis of a variety of Business/Mfg systems within latest state-of-the-art environment. Require min of 3 yrs related system design/analysis experience or 2 yrs programming combined with light systems experience. College degree is preferred but not mandatory. Excellent advancement potential and full career benefits.

SYSTEMS DESIGNER
No. Carolina $23.5K

Our client, a 2+ billion industry giant, due to growth and expansion has openings for several EDP profs for sophisticated IMS shop. Require min 2 yrs design and writing of Business application programs using COBOL (on IBM 360/370, OS/MVS). Full career benefits.

All fees paid to include interview and relocation. For details on the above or additional EDP opptys contact Jim Schwab at (704) 375-0600 or send resume in complete confidence, with current salary, to:

FOX-MORRIS
Personnel Consultants
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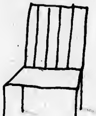
Charlotte, N.C. 28202
EDP Specialist



Systems Analysts:

If you aren't afraid of responsibility,

We'll make a place for you.

The special demands of our Software Systems Design efforts require special people: computer professionals with an abundance of talent who thrive on maximum responsibility. If you're capable of calling the shots, here's your best chance to call an important one of your own. If you have the skills and perceptions we seek, we'll tailor your position to the area of involvement within our endeavors that suits you best.

Software Systems Design is involved in long term state-of-the-art development for our highly successful Level 6 minicomputer system. In addition to designing system level software, this elite group of computer professionals provides consulting support to software development and guides product evolution. Other involvements include international standards activities and presenting to customers concepts for advanced software systems.

The high visibility and growth potential of these positions cannot be stressed enough. If you're a senior systems analyst with 4 or more years experience, and can assume full project and design responsibility at state-of-art levels, there's a position awaiting your definition in one of the following areas:

Distributed Processing

We need top people to evolve structured network architecture and to design congruent products that can fully exploit that architecture. This work impacts computer networks worldwide in such areas as security, network control, network adaptability, application mobility, endpoint independence, and multiprocess symbiosis. Our further success in this area depends on high-level input from the computer professionals who join our efforts.

Advanced Executive Systems Design

Executive system capabilities are critical to the modularity and flexibility of the Level 6 hardware family — and finely-honed professionals are critical to the development of those capabilities. Some of your responsibilities will include special purpose real-time and OEM systems, business and transaction processing systems; and special challenges in modularity and applications mobility across executive environments. You can also anticipate future involvement in the design of a totally new high-end executive.

End User Products

As the importance of end-user facilities continues to increase, we need individuals with backgrounds in such industry-oriented products as data-entry, transaction processing, and office automation. If you have such a background, you will be responsible for designing Level 6 products with consistent user visibility. This is the ideal environment for individuals sensitive to user needs and perspectives.

For a position that offers maximum responsibility and maximum individual definition, please forward your resume, including area of interest and salary history, to:
Ms. B. Hurt, HONEYWELL S/MISD, BM-002,
300 Concord Road, Billerica, MA 01821.

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Honeywell

Career Opportunities in COMPUTER SOFTWARE TECHNOLOGY

ITT Research Institute is expanding its Rome, NY facility and has job openings in the computer field including:

Software engineering
Database management
Software reliability
Computer programming
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Software maintenance
Information retrieval

These positions require a BS or MS degree in engineering or scientific discipline with varying levels of technical experience.

For immediate consideration, please contact;

Lorraina Duvall
(315) 337-0900

IIT Research Institute
Box 1355, Branch P.O.
Roma, NY 13440

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EDP AUDITOR

Join the fastest growing segment of the EDP profession and expand your business career opportunities.

We currently have an immediate opening for a professional in the EDP audit field. Candidates should be degreed and possess 3 to 4 years programming and system design experience in an IBM 370 VS environment. Big 8 and/or MBA, CPA is desirable.

This position, at our administrative headquarters in Columbus will involve audits of large scale installations as well as mini-computer and teleprocessing sites.

For immediate and confidential consideration, please submit a letter or resume to: M. Tomaszewski

BORDEN INC.
180 E. Broad St.
Columbus, OH 43215

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SENIOR PROGRAMMERS

MPB Corporation, Keene, N.H. has immediate openings for two senior programmers with strong manufacturing backgrounds.

These challenging career-oriented opportunities encompass applications programming in all aspects of a manufacturing environment including data communications.

The successful candidates will have a minimum of three years ANS COBOL experience with BLIS COBOL or HONEYWELL EASYCODER a plus.

MPB Corporation is a subsidiary of Wheelabrator-Frye and offers competitive salaries with comprehensive benefits.

To apply, send resume together with salary requirements in confidence to:

Mr. Charles Shaw
Director of Industrial Relations
MPB CORPORATION
Precision Park
Keene, N.H. 03431
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MPB

PROGRAMMER

Want to be visible in a diverse but close-knit department?

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Please send resume and salary history to A. Harrington, Personnel Manager. **H.E. HARRIS & CO., INC., 654 Summer St., Boston, MA 02210. An affirmative action employer.**

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(212) 661 0670 (agency)

PROGRAMMER

Dension University has an immediate opening for a Programmer. The successful applicant must have an ability to work with students and administrators as well as an understanding of programming (BASIC PLUS helpful) and the time-sharing environment, RSTS/E experience desirable. Excellent opportunity for a beginning professional programmer to work in an exciting shop at a variety of tasks. Salary dependent on background and qualifications. Qualified applicants should send resume and salary history to Dr. Jeffrey Jalbert, Computer Center Director, Denison University, Granville, OH 43023

FACULTY POSITION
MIAMI UNIVERSITY

OXFORD, OHIO

Systems Analysis Department may have one or two positions to teach primarily at the undergraduate level. The teaching requirements are in the areas of computer languages (FORTRAN, PL/I, COBOL, & ASSEMBLER), SOFTWARE, COMPUTER ARCHITECTURE, TELECOMMUNICATION and SYSTEMS DESIGN. Ph.D. preferred. Industrial experience will be definite plus. Send your resume to:

Amit K. Jain,
Chairman
Systems Analysis Dept.
Miami University
Oxford, OH 45058

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SCIENTIFIC PROGRAMMER

Position available in a large consulting engineering firm for an individual to develop, document and maintain FORTRAN application programs. Work in an expanding Computer Services Department utilizing an in-house mini-computer with RJE and interactive terminals to multiple large scale remote systems, such as an IBM 370/168, CDC 6600, and DEC System-10 supporting Municipal, Sanitary, Civil and Environmental Engineering activities including Graphics.

College degree required with engineering program experience in FORTRAN desirable. Located 45 minutes north of Milwaukee on Lake Michigan.

We offer an excellent salary and fringe benefit program including health, life and disability income insurance plus a fully paid pension program.

Send resume in confidence or call collect:

DONOHUE & ASSOC., INC.
Consulting Engineers
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Sheboygan, WI 53081
(414) 458-8711
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YOURDON
is looking for people!

YOURDON inc. is widely known as *the* leading consulting, training, software and publishing firm in the fields of structured analysis, structured design and structured programming. We've published over a dozen books and a hundred technical articles, and have provided our services to over 20,000 people in 5,000 organizations. In fact, if you *haven't* heard of us, chances are you haven't heard of the "structured revolution" — and you probably shouldn't bother applying for the jobs listed below!

Because of a major reorganization and continued rapid growth, we currently have openings in the following areas:

Consultant/Instructors. Several consultants are needed to support our education and client consulting activities throughout the USA, Canada, Europe, Australia and South America. Ability to communicate effectively with clients is essential, and a thorough understanding of structured analysis, design and programming is a *must.* Heavy travelling is involved.

Programmers. Application and systems programmers are needed for compiler projects and our own internal business applications. Familiarity with UNIX and the "C" programming language is highly desirable, and knowledge of structured design/programming is a must.

Operations Manager. An experienced individual is needed to manage our PDP-11 installation and the operation of our internal business systems. Our configuration includes a PDP-11/45 CPU, 256K bytes of memory, two dozen DASI and Omron terminals, a Graphics Systems phototypesetter (which was used to set this ad), and the usual peripherals. Our business system includes order entry, invoicing, receivables and a variety of marketing applications — with plans for several additional applications in the future.

Marketing Representatives. We are seeking several marketing representatives with experience (a) selling software packages, (b) selling consulting and training services, and (c) selling in the international marketplace. Exposure to structured analysis, design and programming is highly desirable.

There are several things common to all of these job openings — generous salaries, liberal fringe benefits, a friendly (though slightly crazy!) office staff, and *lots* of work. If you're interested, send your resume, with salary requirements, directly to:

Henry Green
YOURDON inc.
1133 Avenue of the Americas
New York, New York 10036
212-730-2670

SYSTEMS PROGRAMMER

A multimainframe CDC CYBER-175 installation in a scientific computing environment is seeking a Systems Programmer to assist in developing and maintaining operating system software. At least 2 years experience on large scale systems is required. Prior experience on CDC equipment is desirable.

Fermilab, a high energy physics research laboratory, is located on a 6,800 acre site in the far western suburbs of Chicago. We offer a salary commensurate with experience, a liberal fringe benefit package, and an opportunity for a challenging and rewarding career.

Interested candidates should send their resume or contact:

James Lasenby
FERMI NATIONAL ACCELERATOR LABORATORY
P.O. Box 500
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Programming Systems Development

If you have big ideas, and a big appetite for the leading edge, you belong with us ...at GTE.

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At GTE Financial Services Division, we count terminals by the thousands, not hundreds. Our network supplies the lifeblood of the financial industry worldwide. We deliver the information that's needed, where it's needed, when it's needed...on-line in real time. And that job takes a lot of doing.

We have openings in both Systems Software and Application Development for people to develop the new network and the most comprehensive set of information and communication services in the industry.

—Systems Programmer-CICS. Initially responsible for CICS generation and maintenance under direction of Software Specialist. Intermediate-level position requiring familiarity with IBM systems and some IBM assembly language experience. This is an opportunity to learn the system from the inside out.

—Software Specialist-Operating Systems. Will have primary responsibility for performance and enhancement of VSI and VM and ultimately MVS. This is a lead position requiring five years in systems software with at least two years in VSI intervals. VM experience helpful but not required.

—Software Specialist-CICS. Will have primary responsibility for performance and enhancement of CICS. This is a lead position requiring five years in systems software with at least two in CICS intervals. Experience in a TCAM/NCP environment very helpful.

—Senior Programmer/Analysts. Intermediate and lead positions requiring experienced professionals in design and programming on-line applications using CICS, VSAM, BAL and COBOL. Must be able to translate functional requirements into detailed specifications and high performance programs.

If you qualify, this is an opportunity to tackle problems of a type and scale rarely available...and to benefit from a career association with an organization that sets the pace in its field. Please apply by sending your resume, describing your accomplishments and including your salary history. Send your resume to:

Mr. T.J. Lynch
Personnel Department
GTE Information Systems
East Park Drive
Mt. Laurel, New Jersey 08057
Telephone: (609) 235-7300

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CHALLENGE

MARKET SUPPORT Hardware/Software

Sperry Univac has immediate professional openings in its rapidly expanding Marketing division for Programmer Analysts, Senior Programmer Analysts, Applications Engineers and Senior Applications Engineers. Assignments will be in the areas of APPLICATIONS ENGINEERING (hardware and software), SYSTEMS SOFTWARE SUPPORT (pre and post-sales), SYSTEMS ANALYSIS. Based in Irvine, California, these positions will require limited to moderate travel, broad exposure to the Univac organization, as well as considerable customer contact.

PROGRAMMER ANALYSTS

Requires a BSCS or equivalent with a minimum of 6 years experience. Will produce internal specifications and detailed design from analysis of customer requirements. Must be able to estimate software development costs from detailed problem definition.

APPLICATIONS ENGINEERS (HARDWARE)

Requires BSEE or BSCS and 2-4 years experience in digital computer systems to include knowledge of configurations, peripherals, special interfaces, applications. Will provide field hardware technical and/or proposal support. Pre-sales candidates must have experience in proposal generation.

APPLICATIONS ENGINEERS (SOFTWARE)

Requires BSCS or equivalent and 3-8 years experience to include knowledge of assembly languages, operating systems, high-level languages, and the ability to provide pre and post-sales software support.

We'll offer you an exceptional opportunity to advance your career and be directly involved with state-of-the-art technology. In addition, you'll receive a competitive salary and comprehensive benefits program that includes company-paid dental insurance. We invite you to send your resume to the address below or phone 714/833-2400 for additional information.

SPERRY UNIVAC

MINI-COMPUTER OPERATIONS
2722 Michelson Drive, Irvine, CA 92713

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COMPUTER SYSTEMS ENGINEER

The Upjohn Company, a world-wide manufacturer of pharmaceuticals, health care products, chemicals, and agricultural products has a challenging opportunity for a Computer Systems Engineer on the staff of our Computer Services group which supports a 158 and 158-AP.

Responsibilities include trouble shooting operating system and telecommunications related software/hardware problems, implementation and support of various software technologies, advising management on enhancements to our hardware and software environment especially in the telecommunications area.

Position requires demonstrated ability in the systems programming area; a background in MVS; at least two S/370 languages including assembler; a BS degree in Computer Science or related field; special background in telecommunications, CICS, or IMS desirable.

Kalamazoo is a medium-sized Southwestern Michigan community with immediate access to an excellent mix of cultural, educational and recreational pursuits including numerous lakes and a four-season climate.

Please send resume including salary history and confidence to:

Upjohn

Judy Matousak
The Upjohn Company
7171 Portage Road
Kalamazoo, Michigan 49001
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Altamonte Springs, FL 32701

COMPUTER PROGRAMMER INSTRUCTOR

For September 5th start, to teach business programming concepts and applications. A minimum of three years experience as a business computer programmer plus extensive working knowledge of COBOL language is required. B.A. degree and some operations experience is desirable. For application information apply or contact:

Personnel Office-Recruitment
Des Moines Area
Community College
2006 S. Ankeny Blvd.
Ankeny, Iowa 50021
(515) 964-6868
Equal Opportunity Employer

PROGRAMMER COBOL & DATA BASE

Middle Tennessee testing and research company (3,000 employees, small town environment) has immediate openings for programmer/analysts. 370/165 MVT moving towards VS.

BS or MS, 3 to 10 years business applications programming COBOL, with at least 2 years design/applications experience using major DBMS (System 2000, IMS).

Write or send resume including recent salary history to:

Employment

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WE NEED:

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- PROGRAMMER (COBOL) with experience in financial applications including multi-state payrolls

If you have 3 or more years' of progressive experience in an IBM 370 OS/VS1 environment, send your resume with salary history to: Dept. RBG, Red Lobster Inns of America, Inc., P.O. Box 13330, Orlando, Florida 32859.

Red Lobster®

An Equal Opportunity And Affirmative Action Employer M/F

SYSTEMS OPENINGS

Cummins Engine Company, the world's largest independent manufacturer of diesel engines, has immediate openings in the Systems area.

COMPUTER SERVICES SPECIALIST

Responsibilities include creating and maintaining job control language and cataloged procedures for production jobs; program problem resolution; and production job control efficiency recommendations, etc. This position rotates on all three shifts.

Candidates should have a degree in Computer Science, math, engineering or business, with experience in programming language and familiarity with IBM job control language.

Candidates should have three or more years experience supporting a large IMB/VS DB/DC or CICS/VS environment. Responsibilities include generation and maintenance of the subsystem, problem determination and resolution, PTF application, applications programming support and performance monitoring and tuning.

A working knowledge of the MVS operating system, JES2, and VSAM is required. VTAM experience is desirable. A bachelor's degree in Computer Science or related field is preferred.

We provide an excellent opportunity for talented systems programmers seeking continuing challenges in a state of the art information processing environment. Our corporate data center facilities utilize a 370/168 and 3033 with MVS, IMS/VS, CICS/VS, JES2, ACF VTAM/NCP, and TSO. We also provide computing support for Cummins Engine Company plants at various locations in the eastern half of the United States and in the United Kingdom.

Cummins had 1977 sales of over $1.26 Billion, and is headquartered in Columbus, Indiana, a community of 35,000, renowned for its architecture.

All replies should be sent in confidence to:

Cummins

**R.W. Meyer, Jr.
Cummins Engine Company, Inc.
1460 North National Road
Columbus, IN 47201**

An affirmative action equal opportunity employer. M/F/H

Director
Florida Education Computing Project

The Director, along with a small staff of professionals, is charged with promoting increased effectiveness, efficiency and equity in educational computing throughout the Florida system of public education.

The FECP makes recommendations regarding educational computing policy, provides technical assistance to educational institutions, administers contracts for improving educational computing, and advises the Commissioner of Education regarding the acquisition of computing hardware and software by school districts, community colleges and universities.

The ideal applicant will have extensive experience in all aspects of computing in an educational environment, including technical experience with state-of-the-art concepts. Other essential qualifications include strong verbal and written skills and experience in dealing with multiple vendors, users and upper-level administration. Leadership experience in project management is preferred.

A master's degree with major in computer science, business administration or educational administration and 10 years of progressively responsible experience in computing services and administration is required. FECP is located in Tallahassee, the state capital.

Applicants should respond to Mr. Robert Willits, Administrative Employment Manager, 2nd Floor HUB, University of Florida, Gainesville, Florida 32611 by August 14, 1978.

Equal Employment Opportunity/ Affirmative Action Employer

SYSTEM SOFTWARE PROGRAMMER

The University of Minnesota has immediate openings on its Technical Support Staff for entry level through senior level personnel with appropriate experience in one of the following areas:

SUPPORT SOFTWARE-involvement with compilers, assembler installation & maintenance as well as maintaining other support software such as **MARK IV, PANVALET** and **UCCONE.**

DATA BASE SOFTWARE-installation & maintenance of **IMS/VS, UCC10** & other data base related software.

TELEPROCESSING SPECIALIST-involvement with **NCP/VS, VTAM** and installation of 3790's.

Fringe benefit package very competitive including Dental plan, educational opportunities & optional 4 day work week. Salaries available to 25K depending on qualifications.

Min. qualifications: BA/BS, or equivalent training or experience plus min. 2 yrs experience on IBM 360/370.

APPLY: UNIVERSITY OF MINNESOTA PERSONNEL, 2651 University Ave., St. Paul, MN 55114.

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Immediate Need

COMPUTER ANALYSTS/PROGRAMMERS

Major supplier of turn-key minicomputer systems and broad range of specialized software application packages is expanding its permanent technical staff to meet market needs. Attractive compensation package for persons knowledgable in BASIC, COBOL, RPG or manufacturers' derivitives. Call Mr. Graffham after Noon on Monday and before 2 P.M. Friday to arrange interview. Phone 305/753-0020.

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10191 W. Sample Road
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Course Developers For Computer-Based Instruction

Systems Programmers With Experience In PASCAL

The Educational Services Division requires experienced individuals to develop and maintain software and courseware for computer-based training courses. This is an excellent opportunity to work with a new group of educational and computer specialists to develop computer-based instruction to train employees and customers in the use of Digital Equipment Corporation machines.

The Computer-Based Course Development Group is made up of educational specialists who are sensitive to good programming techniques. We are now looking for computer specialists who are sensitive to good educational techniques.

If you have experience in systems analysis, data structures, and interactive programming as well as experience in PASCAL or another ALGOL family language, we would like you to consider this unique opportunity to broaden your technical background while communicating your expertise.

Positions are located in our new corporate training facility in Bedford, Massachusetts.

If you are interested and qualified, please forward your resume, including salary requirements, to Mary Ann Joyce, Digital Equipment Corporation, Dept. H731 3807, 129 Parker St., Maynard, Massachusetts 01754. We are an equal opportunity employer M/F.

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DATA PROCESSING PROFESSIONALS

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Our business is the procurement, distribution, and wholesaling of consumable food and related products. It's a business that we know and in which we excel ... where our very ability to function is tied to data processing systems. Our Information Systems Group functions as an integral part of our management team. They reflect the vitality, expertise, and professionalism of our entire organization. We have such an organization because we learned long ago that if we provided careers for our associates, they would provide the profitability and growth. At Fleming it is not only your career ... it's OURS.

PROGRAMMERS

We presently have immediate openings in our Topeka Information Systems Groups for Senior Programmer Analysts. Three to five years programming experience required. Expertise in COBOL mandatory. Prefer work in DOS/VS environment on IBM equipment. We offer challenging work assignments, competitive salary and excellent benefit package. Send resume and salary history in complete confidence to:

Diana Hawkins
Fleming Companies, Inc.
P.O. Box 1160
Topeka, Kansas 66601

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Fleming

COMPUTER PROFESSIONALS

Control Data Corporation has career growth opportunities in pre-sale, post-sale and consulting located throughout the United States.

APPLICATIONS

Applicants should have experience in one of the following areas:

- **PROGRAMMER/DESIGN ANALYSTS**

(Opportunities in Detroit, Dallas, Seattle, Minneapolis, Portland, Ore., San Francisco Bay Area and Washington, DC)

COBOL, FORTRAN, BASIC
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IBM 370/360 OS, VS
Math Modeling (San Diego)

- **DATA BASE ANALYSTS**

(Opportunities in Detroit, Dallas, Seattle, Minneapolis, San Francisco Bay Area and Washington, DC and Teheran, Iran.

COBOL, FORTRAN
Total System 2000 IMS SPSS

- **SOFTWARE DEVELOPMENT**

(Opportunities in Detroit, Minneapolis, New York City, San Francisco Bay Area, and Washington. DC)

Requirements Analysis
General and Detailed Design.
Systems Analysis
Project Leadership
Information Systems Implementation
Knowledge of Time Sharing Usage

OPERATING SYSTEMS

Applicants should have experience in maintaining, modifying or extending any of the the following operating systems:
or have extensive assembly language on any of the above computers,

- **CYBER 17X, 6000, or other large systems with**

NOS, NOS/BE, SCOPE, KRONOS, or OS (Opportunities in Albuquerque; Boston; Birmingham; Chicago; Detroit; Fredericksburg; Livermore, California; Miami; Monterrey, California; New Jersey, Philadelphia; Seattle; St. Louis; San Francisco Bay Area; Tulsa, Oklahoma; Washington, D.C., and Teheran, Iran).

- **System 370 or 360 with DOS, VS, VSI, SVS or MVS**

(Opportunities in Atlanta; Dallas; Milwaukee; Minneapolis; New York; Philadelphia; and Springfield, Ill.).

- **CYBER 18 or other minis with 1700 MSOS, RCOS, ITOS or OS**

(Opportunities in Los Angeles and New York City).

- **Intel 8080 or other Microprocessors**

(These positions in the Houston and Philadelphia areas)

- **NEW COLLEGE GRADS**

If you have experience in any of the above areas, we have openings located throughout the U.S.

COMMAND & CONTROL

- **SYSTEMS ENGINEERS/PROGRAMMERS**

(Opportunities in New England, New Jersey Shore, Norfolk/Newport News, Virginia, San Diego, California and Washington, DC)

Command Control Design H/W, S/W, F/W
Programming and Check-out
Training, Planning and System Design
Interface Engineering and Integration
Documentation and Technical Writing
Electronic Switching

For immediate consideration, please send resume, salary history and geographical preference to John N. Powers at the address below

CONTROL DATA CORPORATION
An Affirmative Action Employer M/F

60 Hickory Dr., Waltham, Mass. 02154
OR CALL COLLECT:
(617) 890-4600, ext.245

PCC PERTEC COMPUTER CORPORATION

Career opportunities are available for the following professionals:

DISTRIBUTION DEVELOPMENT MANAGER (Chatsworth, CA.)

7 years experience in the multi-channel distribution systems used to market computer products. Locate and qualify new retail computer stores. Managerial experience a must.

MANUFACTURING ENGINEER (Irvine, CA)

2 years in manufacturing and operations of computer products or related industrial background. Experienced in work methods, work station layouts and new product introduction.

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Positions allow self-direction in making contacts in the solicitation of new customers and retail distributors. Requires technical knowledge of mini or micro-computers and customer requirements. Involves 50% travel.

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2+ years experience in data entry, distributed data processing, or remote job entry computer equipment. Sales must have been made to the end-user market as opposed to the OEM market.

Pertec Computer Corporation employees receive outstanding benefits including life, medical, dental insurance, long-term disability insurance, stock purchase plan, profit sharing/retirement plan, and up to 25½ paid days off per year. Please send resume with salary history to:

PERTEC COMPUTER CORPORATION

9601 Lurline Avenue
Chatsworth, California 91311
An Equal Opportunity Employer M/F

A SUPERVISORY OF ANALYSIS AND PROGRAMMING position is available in the User Services group of West Virginia Network for Educational Telecomputing. Requirements include technical competence at the Ph.D. degree level in applied mathematical analysis; 8 years experience in analysis and programming on large computer systems; and 3 years technical supervisory experience. Salary open. Apply by August 11, 1978 to Judy Martin, WVNetwork, 837 Chestnut Ridge Rd., Morgantown, WV 26505. (304) 293-5192.

Affirmative Action/
Equal Opportunity Employer

Data Processing

Manager, Systems & Programming

Grow with Alaska!

This position has the responsibility for the systems and programming staff in the largest bank in Alaska. Duties include scheduling work, establishing schedules and standards, training and development of the staff, and routine management functions in an IBM 370 shop.

Qualifications include a minimum of 8 years' experience in systems & programming with 2 or more years in a management position, recent experience with medium sized IBM 370 hardware and software, and strong management skills.

Send resume including salary history to V.F. Garvy, Personnel Director, P.O. Box 600, Anchorage, Alaska 99510. An equal opportunity employer m/f.

National Bank of Alaska

Data Processing Opportunities

Josten's is a growth-oriented, light manufacturing company listed on the NYSE, with over 20 consecutive years of increasing sales and earnings. Our data center uses both IBM and Honeywell main frames and is located just 50 miles south of Minneapolis, in Owatonna, Minnesota.

TECHNICAL SUPPORT ORGANIZATION

- Senior Technical System Engineer
  - Responsible for system software support
  - 5-8 years experience with a minimum of 2 years systems engineering responsibilities

SYSTEM PROGRAMMING ORGANIZATION

- Senior System Analysts
  - 5-7 years experience in manufacturing or order processing applications
- System Analysts
  - 3-5 years experience in manufacturing or financial applications
- Programmers
  - 1-3 years COBOL experience

OPERATIONS ORGANIZATION

- Computer Operators
  - 1-2 years operating experience using Honeywell or IBM operating systems

These opportunities provide competitive salaries commensurate with your experience and generous fringe benefits including health and life insurance, education assistance, and a profit sharing plan.

For prompt and confidential attention, call collect or send resume to:

(507) 451-6410

Charles Christian
or Duane Noerenberg
JOSTEN'S, INC.
Owatonna, Minnesota 55060

An Equal Opportunity Employer

• Software
• Real Time Programming

Advanced Research is only the beginning of the involvement you'll have at Bendix

We're a highly diversified FORTUNE 100 company well known for developing and utilizing the most advanced technology for our worldwide interests in the automotive, aerospace/avionics, industrial energy, and shelter industires. We offer commensurate salaries, fine benefits and the opportunity to work with the other top-flight professionals at our Corporate Research & Development Center in Southfield, Michigan. Openings are for:

Real Time Programmers

Requires a minimum of 2 years experience with real time computer applications. Advanced degree preferred. Ideal candidate will offer background that combines experience with FORTRAN and assembly language for minicomputers; Interdata preferred but others acceptable. Will work on data acquisition, hybrid simulation and support of scientific software and hardware.

Software Engineers

Requires a minimum of one year's small computer programming experience — preferably both assembly and higher-level language programming. BS or MS/EE or Computer Science. Will design computer programs for demanding applications including microprocessors, computer operating systems and real-time computer control systems.

Digital Systems Engineers

Requires minimum of one year's digital systems design experience and an advanced degree. Prefer candiate with some combination of background in computer arechitecture, digital logic design and computer programming.
Send resume, indicating position of interest and salery history, to: Mr. George Gize, The Bendix Corporation, Research Laboratories, Southfield, MI 48076.

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data processing

SR. SOFTWARE PROGRAMMER
The Miller Environment
•State of the Art • Challenging

Miller Brewing Company's outstanding industry growth record has been paralleled in our data processing operation — where the environment reflects the latest in hardware/software and offers the best in challenges and rewards. We're seeking a creative and talented individual who can take on complete responsibility for all critical software control programs and computer operating system software. You'll develop and implement standard procedures and documentation and provide technical assistance for the continuing planning, expansion and direction of the corporate computer installation.

The position requires at least 4 years programming experience and an excellent working knowledge of BAL and either COBOL or PL/I programming language. MVS data center and telecommunication experience is a must. A degree or the equivalent in experience is preferred.

The successful candidate will find an attractive starting salary, a comprehensive benefits package and a highly professional environment where achievement is encouraged and rewarded. For confidential consideration, submit a letter or resume including salary history to: Brian Gray, Dept 812-8, Miller Brewing Company, 3939 W. Highland Blvd., Milwaukee, WI 53208. An Equal Opportunity Employer M/F.

Miller

Data Communications Analysts/Programmers

If you have the potential to move up in management...

Pacific Telephone would like to talk! We serve a growing population in a dynamic market, and offer the right people every opportunity for a successful future. We're interested in highly motivated individuals — those who would enjoy taking an active, enthusiastic role in our mutual development.

The Communications System Representative-Business Systems serves as a member of an industry-specialized marketing team. Primary responsibility will be to provide innovative systems analysis and design of state-of-the-art data communications systems. Additional duties include assisting customers in integrating Bell System communications solutions into their business systems.

We're looking for college graduates with a minimum of 2 years' experience in the design, implementation and maintenance of data communications software and hardware. Four years' experience may substitute for a degree. Exceptional written and verbal communications skills, the ability to work effectively with minimal supervision and a high level of energy are all required.

At Pacific Telephone increased challenge means increased reward. We offer many benefits including tuition aid and a special merit bonus program. Relocation assistance available.

San Francisco & Los Angeles Openings

If you feel qualified and would like more information about a career with us, send résumé or call collect for the area of your choice:

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370 - Third Street, Room 740A
San Francisco, CA 94107

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Management Placement Office, Dept. CW
1010 Wilshire Blvd., Suite 148
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An Affirmative Action/Equal Opportunity Employer

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DIRECTOR
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We have been retained by prominent Upstate NY federal grant, non-profit organization to recruit for an ACCOMPLISHED EDP ADMINISTRATOR. Must be technically current w/ extensive exp in development of hi-level BUSINESS SYSTEMS from REAL-TIME TELECOMMUNICATIONS environ. Hi-visibility spot, offering unlimited career potential.

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SENIOR SYSTEMS ANALYST
PROGRAM ANALYST
PUBLIC UTILITY - LAKES REGION
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Challenging opportunities for career-minded individuals with a demonstrable record of successful systems design & implementation.

Two to four years progressive experience in state-of-the-art systems design with a college degree in business, mathmatics, computer science, economics or engineering. Public utility experience desirable.

Salary commensurate with experience & ability. Comprehensive benefit package. Mail resume to: Carl Jacobs, Employee Relations,

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Jewell P.O. Box 881
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Equal Opportunity Employer/Affirmative Action Employer

Systems Programmers

Put a management-directed fix on your career development.

Join our large internationally prominent management consulting organization. We're looking for outstanding systems professionals with excellent oral and written communications skills, who have the ability to interface with all levels of corporate management.

You must be interested in handling a wide range of consulting assignments in the areas of:

- hardware/software planning
- computer performance evaluation
- overall data center design and facilities planning
- data processing security analyses
- systems level implementation

You must have 3 to 5 years systems programming experience with emphasis on:

- IBM software with internals level knowledge
- conceptual level and understanding of data base management systems and communications monitors
- experience with computer performance evaluation tools and techniques
- familiarity with hardware sizing/selection

We provide excellent salary, comprehensive benefits program, and equity potential. You will be based in the New York City area and must be available to do limited travel. If you're interested, please send a complete resume to: Jeff Sanderson, Box 1746 BH, 711 Fifth Ave., Suite 1600, New York, N.Y. 10022. We are an equal opportunity employer, m/f.

PROGRAMMER/ ANALYSTS

A Good Year For Us
A Better One For You?

DASD Corporation provides data processing services in Atlanta, Cherry Hill, N.J., Chicago, Dallas, Des Moines, Hartford, Houston, Los Angeles, Milwaukee, Minneapolis-St. Paul, Omaha, Orlando, Philadelphia, San Francisco, and Seattle.

WE OFFER THE FOLLOWING:

- Challenging opportunity
- Personal recognition
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- Chance to develop potential.

WE NEED AT LEAST 3 YRS. EXPERIENCE IN ANY OF THE FOLLOWING:

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- IMS, TOTAL, other Data Bases
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Please call or send your resume to:

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CORPORATION

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(414) 351-2600

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DATA PROCESSING OPPORTUNITY

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Software/Hardware Professionals

For the stimulation and career growth inherent in developing a whole new generation of large-scale computer systems...

The big move is to NCR/San Diego.

We're involved in one of the biggest, most far-reaching pioneering efforts ever undertaken by a major computer manufacturer. Our award-winning facilities in Rancho Bernardo is the launching site of two development thrusts that will shape the future of NCR. One is on-going development of a large-scale virtual memory system made possible by a new breed of NCR-produced microprocessor firmware. The other is a new interactive system that will break new ground in transaction processing and distributed processing networking.

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You'll be working with our most powerful Criterion mainframes, latest advances in data communications, VLSI circuitry, the newest techniques in emulation, non-disruptive upward migration, and systems architecture. You'll be using new PASCAL-based languages; and all of NCR's far-flung engineering resources will be available to you.

Visibility at all job levels

There are no quiet backwaters in our San Diego operation. As part of one of NCR's highest priority, long-range decision-making enterprises, every software/hardware professional functions in a creative climate that not only permits but requires innovative thinking. You'll be a key member of a small team with broad responsibilities and high visibility.

California living at its best

Our pioneering development groups are concentrated in Rancho Bernardo, 22 miles up the coast from San Diego. Our 114-acre location here has been called "one of the 10 best-designed industrial facilities in the nation". You'll be near one of California's most attractive cities, and 70 miles of beaches stretching from San Juan Capistrano to the Mexican border. You'll have a working and living environment that's the envy of the EDP industry.

Immediate, across-the-board openings

If you have an appropriate engineering or computer science degree (or equivalent), and a year or more of experience in one or more of the areas listed below, contact us at once. For a high level review of your qualifications and a promptly arranged interview, send detailed resume and salary history to: Mr. George Rice, Manager, Professional Placement, Engineering and Manufacturing, NCR Corporation, 16550 W. Bernardo Drive, San Diego, CA 92127.

Vacationing near us this summer? A brief visit to NCR can be an eye opener. So if you're going to be in our area, plan to stop by. Contact us in advance for a technical interview.

Immediate Openings – Software areas:

- Distributed Network Architecture
- Transaction Processing
- Interactive Processing
- Data Base Design
- Performance Measurement & Analysis
- MIS Applications
- Configuration Management
- Design Automation
- File Access Methods
- Operating System Development
- Compiler Design/Development
- Firmware Development
- Diagnostic Programming
- Test Systems Development
- Software Quality Assurance
- MICR Proof Of Deposit Software
- Systems Architecture

Immediate Openings – Hardware areas:

- Design Automation Engineering
- MICR/OCR/OMR Engineering
- Memory Device Engineering
- Logic Design Engineering
- Functional Specifications
- Components Engineering
- Systems Architecture
- Test Systems Development
- I/O Subsystem Configuration
- Systems Integration Test
- Product Engineering—Mechanical, Optical, Electrical
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Complete Computer Systems

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SR. SYSTEMS ANALYSTS

This is an opportunity to join a new and growing section in the design and launch of advanced on-line systems for product planning, vehicle design and engineering change control. These multi-terminal systems will utilize one of the nation's largest interactive computer centers. We are developing a network of data bases which interact with various engineering activities to capture and disseminate vehicle engineering design data.

We desire individuals with recent design responsibilities for such systems, at least a BS degree, a working knowledge of data base techniques, on-line applications, and superior oral and written communication skills.

Requires at least 5 years experience in analysis of procedures, problem definition, system planning, design and specification of requirements. The job also requires experience in project leadership, implementation planning and user training.

Future upward mobility exists within our multidividisonal corporate organization. We provide top financial remuneration for top performance and one of the best benefit portfolios in the industry. Please forward resume and salary history, in confidence to:

Ford
Car Engineering

Attn: J.B. Shaw
Salaried Personnel
Dept. 2759
P.O. Box 2053
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An Equal Opportunity Employer

HOSPITAL DATA PROCESSING SPECIALISTS

Outstanding opportunities exist for a multi-disciplined health care services organization located in Sunny Southern California utilizing 370/148 OS/VS1 for individuals with health care experience who wish to affiliate with a firm offering state-of-the-art challenges, proven growth potential and top compensation.

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Reporting to the Director of Data Processing, requirements include demonstrated Project Management skills with 6-8 years experience, 2 or more in project Management including CICS/DL1.

SENIOR PROGRAMMER/ANALYST

Qualified candidate will have 3-5 years hands-on experience in application programming using COBOL, and CICS/DL1.

SENIOR PROGRAMMER/ANALYST

Qualified candidate will have 3-5 years hands-on experience in application programming using COBOL, and CICS/DL1.

PROGRAMMER ANALYST

Position requires 1-3 years experience in application programming using COBOL. CICS/DL1 - background a definite asset.

SOFTWARE PROGRAMMER

Applicant will have 3-5 years experience in the design and implementation of on-line interactive networks with expertise in CICS, DL-1, and BAL in an OS/VS-1 environment.

Pacific is part of the Lutheran Hospital Society of Southern California, a leader in hospital management for over 50 years. If you have a proven track record and are ready to join a fast-paced leader, please send your resume including salary history in complete confidence to:

GLORIA KUTCHAI

PACIFIC HEALTH RESOURCES
1423 South Grand Avenue
Los Angeles, California 90015

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MARKETING OPPORTUNITY WITH A LEADING DATA BASE/ DATA COMMUNICATIONS VENDOR

Insyte Datacom is expanding (again). Growing domestic and foreign markets for DATACOM DBMS & TP software require immediate investment in innovative DP marketing professionals for territory sales positions. Must have 3 to 5 years sales experience in the IBM 360/370 marketplace. Insyte Datacom is ideally located in dynamic Dallas, where you and your family can enjoy a secure future and full utilization of your professional skills. Insyte Datacom, a wholly owned subsidiary of Insyte Corporation, a public company, offers an excellent compensation plan and company benefits. Please send resume to Chuck McCoy for immediate consideration.

insyte datacom
corporation
3207 rawlins street dallas, texas 75219
214/526 4280 telex 73 2550

New York/Chicago/San Francisco/Mexico City/Frankfurt, W. Germany/Sidney, Australia.

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...take advantage of the most individualized job search available in The D P industry today. You pay absolutely NO fee for our service. Send us your resume with present salary & geographic preference

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OVERSEAS ADVENTURE $40K+

IRAN

Applications programmer, Systems Engineer, H-6000 or L/66, GCOS/COBOL/GMAP IDS TPE/MULTICS, US firm has 18-24 mo tours w/fam. Ex financial pkg in Tehran. Ski 1 hr fm office. Rush resume: Cybermetrics Corp., P.O. Box 579, McLean, VA 22101. (703) 356-1997. Other positions avail.

RENSSELAER POLYTECHNIC INSTITUTE

Troy, New York

SYSTEMS PROGRAMMERS

RPI has just installed an IBM 3033, and is looking for additional systems programmers to support a network of timesharing terminals and distributed computers.

SYSTEMS DESIGN SPECIALIST: Participate in the design and implementation of major structural changes to 3033 operating system in such areas as I/O device support, virtual memory management, CPU scheduling, and file systems.

HARDWARE AND COMMUNICATIONS SPECIALIST: Will participate in the design, implementation, and support of a multi-cpu communications network, using X.25 protocols on PDP-11 and 3033. Knowledgeable in 370 and DEC equipment and communications hardware. E.E. degree preferred.

COMPILER AND SYSTEMS SPECIALIST: Install, maintain and enhance compilers and other parts of the operating system. Prior VS, VM, or MTS support experience desired.

Salary is open depending on experience. Send resume, 3 professional references, and salary requirements to: Manager of Recruitment, R.P.I., Pittsburgh Bldg., Troy, N.Y. 12181. An *Equal Opportunity/Affirmative Action Employer*

SYSTEMS/ANALYST PROGRAMMER/ANALYST

Our rapidly expanding DP service division needs experienced professionals in both Atlanta and Chicago. We will accept PL1 or COBOL experience with on-line or DBMS preferred. We can offer technical and personal challenge, good salary, liberal fringes and relocation assistance. Call collect (404) 262-2298 or write:

Norrell Systems Services
Suite 201
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Atlanta, GA 30305
EOE

MOVING TO LOS ANGELES?

We are a systems consulting and software firm dealing with major corporations. We have a need for several good programmer analysts with 2-4 years COBOL, BAL, or RPG II experience (CICS, IMS a plus). Excellent benefits, professional environment, and growth opportunity are only a part of what we have to offer. Send resume to:

International Management Systems Corporation
4676 Admiralty Way, Suite 217
Marina Del Rey, Calif. 90291
Attn.: Bob Callender
or call (213) 822-2022

Programmers Software Engineers Software Managers

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The Systems Group of Leeds & Northrup is a leader in real time digital process control systems. An unprecedented growth of over 20% a year, combined with stable commercial markets and a commitment to promotion from within, provides exceptional opportunities and a challenging professional and dynamic working environment. In addition we are located in a clean and quiet area of eastern Pennsylvania, but convenient to Philadelphia. Benefits are all company paid and include 2 weeks vacation, personal days, 12 holidays, life and medical insurance, tuition refund, pension, stock purchase and profit sharing.

We Are Hiring Now!

SOFTWARE MANAGERS

Do you want complete project control and customer interface? Your major responsibility is to direct a team of software professionals from inception of a system to delivery. A technical degree and experience with digital process control systems is desirable.

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If you are "button holed" in a job, this is your opportunity to get hands-on exposure to the entire system. Openings exist in development (micro and minicomputers), applications, system design, man/machine interface, communications and support programs. A technical degree and 2 years experience with FORTRAN or ASSEMBLY in one of the above areas is desirable.

DEVELOPMENT PROGRAMMERS

If you are tired of finishing someone else's work, get in on the ground floor in the new development of systems and applications software. Work in assembly language on new mini or microcomputer projects involving operating systems, man/machine interface and data acquisition.

To investigate your career with an established growth company call anytime 24 hours a day including Saturday and Sunday, (215) 643-2000, Ext. 2010 or send your resume to: Jim Henderson, Manager of Professional Employment, Systems Group, Dept. C-31.

LEEDS & NORTHRUP
Dickerson Road—North Wales, Pa. 19454
Equal Opportunity Employer, M/F/H

SOFTWARE PROGRAMMERS

To define, design, and develop applications software systems for microprocessor controlled digital telecommunication/telephone products.

A BSEE or MSCS or equivalent experience is desirable with 1-3 years experience in designing and implementing real time communication systems in micro or mini computer environments using assembly language.

Please submit your complete, confidential resume to Mr. Chet Tarrant.

An Equal Opportunity Employer M/F

ANACONDA
TELECOMMUNICATIONS

ANALYST - PROGRAMMER

Excellent opportunity to implement a total concept management information system in a fast growing manufacturing division of a NYSE corporation. This is a chance to develop and run the program from ground zero with full management support.

At least two years experience with DEC PDP 11/70 on-line applications required. Must have knowledge of business and manufacturing information flows.

Good benefits. Salary commensurate with experience and ability.

Please send complete, fully detailed resume, including salary history, in complete confidence to:

Mr. Vern F. Moore
Unarco Industries, Inc.
332 South Michigan Avenue
Chicago, ILL 60604
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GRAPHICS EXPERT

PENN STATE is seeking a computer graphics expert to support its research and instructional computing services.

REAL TIME GRAPHICS services are currently provided by an ADAGE ADG/30 terminal which is to be replaced by more modern equipment. The person being sought will participate in the selection of this equipment, and will be responsible for design and implementation of new software in its support. The new person will also be engaged in consulting, training, and documentation in support of both graphics and general academic computer applications.

THE ADAGE is used as a stand-alone computer, and is connected to the IBM System/370 Model 168 (to be upgraded to an IBM 3033 Processor in August, 1978), through which it has a remote job entry capability and access to a System/370 file system. Past uses have been in a variety of disciplines, encompassing such topics as geometric perception, crystal growth, operating system concepts, acoustic phenomena, and biomechanics. The new system will provide support for users in these and other areas.

APPLICANTS should have a Ph.D. degree, or strong equivalent experience, in Computer Science or a related field. Extensive graphics experience is essential. Salary and responsibilities will be commensurate with education and experience. Send resume, including education, professional experience, and salary history, to Dr. Donald T. Laird, Director, Computation Center, 229 Computer Building, University Park, PA 16802.

THE PENNSYLVANIA STATE UNIVERSITY
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PROFESSIONAL STAFFING

CAREER OPPORTUNITIES

PROGRAMMER/ANALYST

WALT DISNEY WORLD has an immediate opening for a Programmer/Analyst. 2-5 years experience in the design and programming of business applications required. This is an opportunity to become involved in a wide range of business applications, including interactive programming in an on-line virtual memory environment.

Qualified applicants should submit a complete resume with salary requirements to:

WALT DISNEY WORLD
Professional Staffing FN-22
Post Office Box 40
Lake Buena Vista, FL 32820

Walt Disney World ®

AN EQUAL OPPORTUNITY EMPLOYER

Maybe.

It's not a Data General answer.

We believe decisions are made to be taken. Not postponed. During the past few years we've taken quite a lot of decisions, particularly when they concern the future of ideas.

That's how we're introducing a new piece of Data General equipment every other week. And new applications daily. Last year that added up to 41% growth rate.

So now we've taken another decision: to take on more people. We want people who want to take decisions, and have the experience to do it.

4 Product Marketing Specialists for Data General European HQ in Paris.

Three to five years' relevant experience in the computer industry, preferably including international experience. Fluent English.

Today we are looking for specialists in four areas: Telecommunications, OEM marketing, Applications references and competition, Instrument and Process control.

The salary levels reflect the importance of these positions. The career prospects are good too.

Send your C.V. to: Jan Cederlund, European Employment Manager, Data General Europe, 61 rue de Courcelles, 75008 Paris. Tél. (01) 766.51.78.

Data General

Software Professionals...

climbing to the top

[illegible]

[illegible] climbing to the top [illegible]

[illegible] Data Communication [illegible] Software Professionals who [illegible] in the development of [illegible] markets. We [illegible] opportunity to accelerate your [illegible] environment.

[illegible] minimum of 3 years [illegible] assembly language [illegible] data base experience [illegible] DEC PDP-11 and microprocessors [illegible] A BSEE or degree in Computer Science or Mathematics is desirable.

[illegible] Illinois, Maryland and California Technology Centers.

[illegible] part of a leader.

CALL (COLLECT) (312) 576 5424
[illegible] including salary history in confidence to:

[illegible] Recruiting Department

MOTOROLA
COMMUNICATIONS GROUP
1301 East Algonquin Road
Schaumburg, IL 60196

TOYOTA

TOYOTA, the nation's number one automobile importer has immediate openings for the following positions:

PROGRAMMER ANALYSTS

Will be responsible for designing, programming and implementation of our Advanced Parts System covering our entire USA Parts Operation. Requirements include Bachelor's degree and 1-3 years experience or equivalent using structure design, COBOL, and TSO for IMS Data Base Systems.

SYSTEMS PROGRAMMER

Will provide technical and system software support to data center personnel. This will entail troubleshooting of system and teleprocessing software/hardware problems involving the operating system, Task Master, and Application Production jobs. Bachelor's degree plus 2 years experience in EDP programming or 4 years EDP programming in lieu of degree required.

We offer a very attractive salary complemented by an outstanding package of company paid benefits. Please send resume with salary history to:

P.R. Dresser

TOYOTA MOTOR SALES, U.S.A., INC.
2055 W. 190th St., Torrance, Calif. 90504
An Equal Opportunity Employer M/F

SYSTEMS PROGRAMMER

370/145 Equipment

DOS/VS, CICS/VS, DL/1, Power

Join our highly talented professional staff in a dynamic 5 year expansion plan of major on-line systems.

The successful candidate will be taking the right step toward a bright future. If you have 3 years of programming and 1 years of systems programming experience, we would like to discuss this opportunity with you.

We offer an outstanding benefits package, 4 weeks vacation, & an excellent salary. Please send resume, with salary history to:
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116 East 76th St
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Join a Successful Team

Yankee is a utility that functions as engineering consultant, designer/design reviewer, operator and troubleshooter and is presently involved in the operation of three nuclear power plants and the design and construction of additional plants.

Yankee has immediate openings for

SOFTWARE QUALITY CONTROL ANALYST

Responsible individual eager to be a prime mover in the design, development, and implementation of FORTRAN, and COBOL. Experience required on large scale CDC, (6600, 17X, 7600) running SCOPE, or NOS. Engineering background helpful. BS/MS with 3-5 years related experience.

ENGINEERING SOFTWARE ANALYST

Assisted in the development, modification and maintenance of engineering software used in the Nuclear (Physics and Safety), 3 years FORTRAN experience with at least 1 year CDC SCOPE or NOS experience. BS/MS in either Engineering or Computer Science.

ENVIRONMENTAL ANALYST

Participate in development of environmental data management system and the mathematical/statistical analysis of biological and oceanographic data. Expertise in FORTRAN and a strong mathematical background required. B.S. with 2 years' experience in scientific programming or M.S.

COMMERCIAL PROGRAMMER ANALYST

Minimum requirements are a degree, 3 years experience in the commercial environment, 1 year COBOL programming and good writing skills. A plus is experience with structured programming, CDC NOS/SCOPE, UNIVAC (formerly Varian minicomputers and data base management systems.

Send resume to R. Scarfo.

YANKEE ATOMIC ELECTRIC CO.
20 Turnpike Road
Westboro, Mass. 01581

YANKEE

West Virginia Network for Educational Telecomputing has an immediate opening for a **STATISTICIAN/SYSTEMS ANALYST** to do statistical computing and to maintain comprehensive statistical software support on a large computer system. Requirements include technical competence at the Masters degree level in applied statistics; 2 years work experience in statistical consulting and software support on a large system; and good oral and written communication skills. Salary Open. Apply by August 11, 1978 to Judy Martin, WVNetwork, 837 Chestnut Ridge Rd., Morgantown, WV 26505. (304) 923-5192.

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SYSTEMS PROGRAMMER

Administrative Data Processing. Minimum requirement two years programming experience in PL/1 or COBOL with one year of Assembly language. Assist in installing and maintaining operating system and software packages. Experience with IBM's SVS and MVS, Generations, and CICS is helpful. Associate degree or equivalent combination of education and experience. Submit salary history with resume. Please apply by August 4, 1978, Personnel Office 110 Nisbet Building, Michigan State University, East Lansing, MI 48824 An Equal Opportunity Employer

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DATA PROCESSING

Evangelical Christian ministry has need for system programmers and computer operator. System programmers must have 3 years IBM ALC experience and at least 2 years IBM VS/1, CICS/VS, or VM/370 system programming experience. Operator must have 3 years IBM 370/135 or larger including CICS/VS and JCL experience. Send resume to Personnel Division, Drawer D, Christian Broadcasting Network, Virginia Beach, VA 23463. An equal opportunity employer.

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Client cos pay all employment expenses. For full details contact, in confidence, Don Owens, (215) 561-6300. FOX-MORRIS PERSONNEL CONSULTANTS, 1500 Chestnut St, Phila, PA 19102

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Moore School of Electrical Engineering
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Permanent, full-time position at educational/research facility operating Sperry/UNIVAC 90/70. B.S. in computer science or equivalent field required along with two years experience in BAL and UNIVAC VS/9 operating systems. Will generate and maintain operating system; consult with vendor on operating system development and maintenance; supervise development and maintenance of in-house enhancements, including special-purpose minicomputer interfaces, in conjunction with faculty and graduate research fellows; consult with faculty and students on operating system problems.

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- Have experience with telecommunications hardware and software.
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- **OPERATING SYSTEMS SPECIALIST**
  (GS-12, Starting Salary of $21,883 PA) Experience in the maintenance, monitoring and optimization of the UNIVAC 1100 series operating system, EXEC 8. Such experience should include systems generations, configuration design, panic dump analysis and implementation and maintenance of operating system "local code";
- **GENERALIZED DATA BASE MANAGEMENT SOFTWARE SPECIALIST**
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  Experience in the establishment and/or operation of a formal software testing and quality assurance operation.

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Social Security Administration

Attn: D. Urbanski
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Baltimore, MD 21235
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SENIOR
ANALYST/PROGRAMMERS

Colorado State University Computer Center operates a CYBER 171 and a CYBER 172 under NOS. These two CDC mainframes are linked to the outside world through a MODCOMP II serving as a front-end communications processor for both synchronous and asynchronous data transmission. Excellent opportunities exist for experienced Analyst/Programmers interested in extending the state-of-the-art in the following areas:

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Responsibilities — software design and development for MODCOMP II supporting up to 256 host computers providing for mixed transmission for synchronous RJE's and async timesharing terminals. Applicants should possess three to five years experience in the development of communications software using various protocols and networking. Experience with CDC operating systems and leadership abilities are highly desirable.

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Responsibilities — design and development of major enhancements to the CDC network operating system. Applicants must possess at least three years of experience with COMPASS assembler language. Experience with NOS, NOS/BE or KRONOS is highly desirable.

Application Software:

Responsibilities — design and development of financial management systems, word processing systems, information storage and retrieval. Applicant should have experience with a wide range of systems, software language and hardware mainframes. Project orinated developmental work in the field of engineering, simulation or modeling is highly desirable.

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SEE OUR RECRUITMENT AD FOR SYSTEMS ENGINEERS ON PAGE 11.

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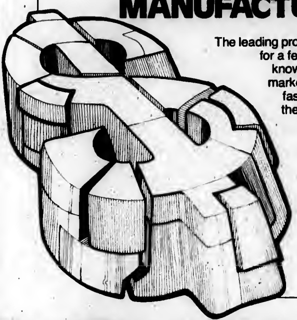

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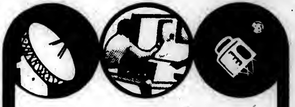

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West Virginia Network for Educational Telecomputing has an immediate opening for a **SYSTEMS ANALYST I** to do analysis and programming in support of academic research and instruction. Requirements include technical competence at the Bachelors degree level in a scientific discipline; 3 years work experience in scientific programming and analysis on a large computer system; demonstrated proficiency in 2 higher level languages, and good oral and written communications skills. Salary open. Apply by August 11, 1978 to Judy Martin, WVNetwork, 837 Chestnut Ridge Rd., Morgantown, WV 26505. (304) 293-5192.

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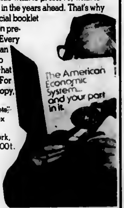
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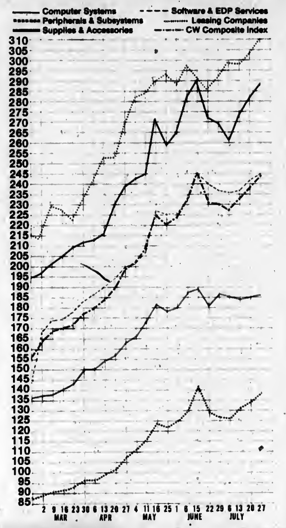

Earnings Reports

AMPEX

Year Ended April 29

	1978	1977
Shr Ernd	$1.76	$1.31
Revenue	322,050,000	287,429,000
aSpec Cred	6,500,000	5,435,000
Earnings	18,742,000	14,224,000
3 Mo Shr	.44	.54
Revenue	87,794,000	78,238,000
aSpec Cred	814,000	2,507,000
Earnings	4,998,000	5,853,000

a-Tax-loss carryforward.

COMSERV

Year Ended Dec. 31

	1978	1977
Shr Ernd	$.34	$.25
Revenue	3,083,002	2,240,823
aSpec Cred	52,000	81,000
Earnings	290,825	197,333

a-Tax-loss carryforward.

COMPUTER TRANSCEIVER

Year Ended Feb. 28

	1978	1977
Shr Ernd	$.31	$.30
Revenue	4,151,037	4,126,823
Earnings	282,025	271,606

GENERAL AUTOMATION

Three Months Ended April 29

	1978	1977
Shr Ernd	$1.34	$.08
Revenue	26,041,000	20,482,000
Earnings	3,387,000	208,000
6 Mo Shr	1.68	.50
Revenue	67,217,000	51,544,000
Spec Cred	a1,977,000	(108,000)
Earnings	4,236,000	1,400,000

a-Includes gain from sale of holding in Synertek, Inc. of $1,625,000 and tax-loss carryforward credit.

LOGICON

Year Ended March 31

	1978	1977
Shr Ernd	$.62	$1.50
Revenue	33,670,000	20,507,000
Earnings	830,000	570,000
3 Mo Shr	.02	.32
Revenue	6,416,000	7,048,000
Earnings	23,000	283,000

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CLOSING PRICES WEDNESDAY, JULY 26, 1978

All statistics compiled, computed and formatted by
TRADE QUOTES, INC.
Cambridge, Mass., 02139

COMPUTER SYSTEMS

EXCH		1978 RANGE (1)	CLOSE JUL 26 1978	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMDAHL CORP	28- 56	38 7/8	+ 1/2	+1.3
N	BURROUGHS CORP	39- 80	76 7/8	+2 3/8	+3.1
C	COMPUTER AUTOMATION	23- 38	34 3/4	+1	+2.9
N	CONTROL DATA CORP	23- 37	37 1/4	+ 1/4	+0.6
O	CRAY RESEARCH INC	21- 48	47 3/4	+3 5/4	+7.3
N	DATA GENERAL CORP	42- 62	61 3/4	+2 1/8	+3.3
N	DATAPOINT CORP	34- 64	57 1/4	+ 1/2	+0.8
N	DIGITAL EQUIPMENT	39- 53	47 1/4	+ 3/8	+1.3
R	ELECTRONIC ASSOC.	2- 8	7 5/8	+ 3/8	+5.6
A	ELECTRONIC ENGINEER.	11- 19	12	-4 3/4	-28.3
O	FOUR-PHASE SYSTEMS	19- 34	34	+1 3/4	+5.4
N	FOXBORO	28- 40	38 3/8	0	0.0
O	GENERAL AUTOMATION	7- 20	19 3/8	+ 1/2	+2.4
O	GRI COMPUTER CORP	1- 1	1 3/4	+ 3/8	+27.2
N	HEWLETT-PACKARD CO	62- 85	83 5/8	-1 1/8	-1.3
N	HONEYWELL INC	43- 65	64 5/8	+1 5/8	+2.3
N	IBM	236-274	273 1/2	+3 3/4	+1.3
O	MANAGEMENT ASSIST	9- 18	17 3/8	- 1/8	-0.7
O	MICRODATA CORP	10- 18	17 5/8	+1 3/8	+8.4
O	MINI-COMPUTER SYST	3- 8	5	0	0.0
O	MODULAR COMPUTER SYS	7- 13	14 1/4	+ 3/4	+5.3
N	NCR	57- 38	38 5/8	+5 5/8	+2.8
O	PRIME COMPUTER INC	20- 39	27 5/8	- 7/8	-3.5
N	PERKIN-ELMER	17- 24	24	+ 1/2	+1.9
N	RAYTHEON CO	29- 51	51	0	0.0
N	SPERRY RAND	35- 45	44 7/8	+2 1/8	+4.9
A	SYSTEMS ENG. LABS	11- 21	17 3/8	- 1/2	-2.7
A	WANG LABS.	12- 26	23 7/8	0	0.0

LEASING COMPANIES

EXCH		1978 RANGE (1)	CLOSE JUL 26 1978	WEEK NET CHNGE	WEEK PCT CHNGE
O	ALANTHUS CORP	3- 6	5 3/4	0	0.0
O	BOOTHE COURIER CORP	13- 18	15 3/4	+ 1/8	+0.7
O	COMDISCO INC	9- 20	20 1/4	+5 3/4	+9.4
A	COMMERCE GROUP CORP	1- 1	5/8	0	0.0
A	COMPUTER INVSTRS GRP	1- 5	7/8	0	0.0
N	DATRONIC RENTAL	1- 2	5 1/2	0	0.0
A	DCL INC	3- 4	3 7/8	+ 5/8	+5.5
N	DPF INC	8- 54	13 5/8	+1 1/2	+12.5
N	ITEL	16- 27	27 1/8	+1 5/8	+6.5
N	LEASCO CORP	24- 33	32 5/8	- 1/8	-0.5
O	LEASPAC CORP	1- 4	2 7/8	- 1/8	-4.1
A	PIONEER TEX CORP	5- 7	5 5/8	0	0.0
N	U.S. LEASING	13- 57	56 3/4	- 1/8	-0.7

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 5 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

SOFTWARE & EDP SERVICES

EXCH		1978 RANGE (1)	CLOSE JUL 26 1978	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1 1/8	- 1/8	-10.0
O	ANACOMP INC	8- 20	17 1/2	+ 3/8	+3.7
A	APPLIED DATA RES.	8- 16	13 3/8	+ 3/8	+4.2
N	AUTOMATIC DATA PROC	24- 34	32 3/4	+1 7/8	+6.0
O	COLEMAN AMERICAN COS	1- 2	1 7/8	0	0.0
O	COMPU-SERV NETWORK	7- 12	7 1/4	- 1/4	-3.3
O	COMP ELECTION SYSTMS	9- 10	9	0	0.0
C	COMPUTER HORIZONS	1- 5	4	0	0.0
O	COMPUTER NETWORK	8- 12	11	- 1/4	-2.2
N	COMPUTER SCIENCES	8- 14	14 3/8	+2 5/8	+22.3
C	COMPUTER TASK GROUP	1- 4	3	0	0.0
O	COMPUTER USAGE	2- 4	2 5/8	0	0.0
O	COMSHARE	6- 17	14 3/4	+1 1/2	+9.8
O	DATA DIMENSIONS INC	4- 7	5 5/8	+ 1/8	+2.2
O	DATATAB	1- 2	7/8	0	0.0
N	ELECTRONIC DATA SYS.	15- 23	19 1/4	- 5/8	-3.1
O	INSYTE CORP	1- 2	1 3/4	- 1/4	-12.3
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 4	3 5/8	0	0.0
O	KEYDATA CORP	1- 5	2 1/4	+ 1/4	+12.5
A	LOGICON	11- 15	13 5/8	+ 3/4	+5.9
A	MANAGEMENT DATA	1- 1	7/8	0	0.0
A	NATIONAL CSS INC	55- 28	27	+1 3/4	+6.9
O	NATIONAL DATA CORP	7- 12	10 5/8	-1 1/8	-9.5
A	ON LINE SYSTEMS INC	17- 26	23 1/2	0	0.0
N	PLANNING RESEARCH	4- 8	7 3/8	+ 1/2	+7.2
O	PROGRAMMING & SYS	1- 1	3/4	0	0.0
O	RAPIDATA INC	3- 6	5 5/8	+ 1/8	+2.2
O	REYNOLDS & REYNOLD	18- 28	27	+ 1/2	+1.8
O	SCIENTIFIC COMPUTERS	3- 6	4 3/4	0	0.0
O	TYMSHARE INC	18- 27	25 5/8	+ 1/8	+0.4
A	URS SYSTEMS	5- 7	7 1/8	+ 1/8	+1.7
N	WYLY CORP	1- 5	5 3/4	- 1/4	-4.2

PERIPHERALS & SUBSYSTEMS

EXCH		1978 RANGE (1)	CLOSE JUL 26 1978	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	14- 23	23 3/4	+ 3/4	+3.2
O	ADVANCED MEMORY SYS	7- 14	13 3/8	+ 5/8	+4.8
N	AMPEX CORP	10- 17	14 5/8	- 1/4	-1.6
O	ANDERSON JACOBSON	5- 9	9 3/8	+1 3/8	+17.1
N	APPLIED DIG DATA SYS	13- 18	15 1/8	+ 1/4	+1.6
O	BEEHIVE INT'L	4- 7	6	+ 1/8	+2.1
A	BOLT,BERANEK & NEW	6- 11	7 7/8	- 1/2	-5.9
N	BUNKER-RAMO	10- 18	17	+1 1/4	+7.9
O	CALCOMP	3- 9	8 7/8	+1	+12.6
O	CAMBRIDGE MEMORIES	3- 8	5 5/8	+ 1/8	+2.2
N	CENTRONICS DATA COMP	16- 29	27 3/4	- 3/8	-1.3
O	COGNITRONICS	1- 4	3	0	0.0
O	COMPUTER COMMUN.	6- 10	8 3/4	+1	+52.9
O	COMPUTER CONSOLES	4- 9	8	+1	+14.2
A	COMPUTER EQUIPMENT	3- 6	4 5/8	+ 1/8	+2.9
O	COMPUTER TRANSCEIVER	1- 2	1 1/2	0	0.0
O	CONTEN	9- 28	26 1/2	+ 7/8	+3.4
N	CONRAC CORP	19- 26	19 7/8	+ 3/8	+1.9
O	DATA ACCESS SYSTEMS	3- 5	4 1/2	0	0.0
O	DATA 100	9- 20	19 7/8	0	0.0
A	DATA PRODUCTS CORP	15- 24	21 7/8	+1 1/8	+3.4
C	DATA TECHNOLOGY	4- 4	4	0	0.0
C	DATUM INC	2- 5	4 5/4	- 1/8	-2.8
O	DECISION DATA COMPUT	2- 4	3 5/8	0	0.0
O	DELTA DATA SYSTEMS	1- 1	3/8	0	0.0
A	DOCUMATION INC	6- 24	23 1/4	+ 1/4	+1.0
C	DATARAM CORP	6- 24	19 1/4	- 3/4	-3.7
N	ELECTRONIC M & M	4- 7	6 1/8	- 1/8	-2.0
O	FABRI-TEK	1- 2	1 3/8	0	0.0
O	GENERAL COMPUTER SYS	1- 3	2 1/2	+ 1/4	+11.1
N	HAZELTINE CORP	10- 16	14 3/4	+ 3/8	+2.4
N	HARRIS CORP	40- 61	61	+1 3/8	+2.7
O	INFOREX INC	6- 10	8 1/8	- 1/8	-1.3
O	INFORMATION INTL INC	8- 15	8 1/4	0	0.0
O	INTEL CORP	39- 62	62	+1	+1.6
A	LUNDY ELECTRONICS	4- 3	3	0	0.0
C	MSI DATA CORP	12- 59	17	+ 1/8	+0.7
N	MEMOREX	27- 49	45 1/2	+5 1/2	+53.7
N	MOHAWK DATA SCI	6- 54	53 5/4	+2 1/4	+19.5
O	PENRIL CORP	5- 12	10 5/8	+ 1/8	+1.5
N	PERTEC CORP	9- 14	10 3/4	- 1/8	-1.1
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	2- 2	2	0	0.0
O	QUANTOR CORP	2- 5	3	+ 1/4	+9.0
O	RECOGNITION EQUIP	7- 52	12 1/8	+1 3/4	+16.8
O	SCAN DATA	1- 4	4 3/8	+ 5/8	+18.6
N	STORAGE TECHNOLOGY	19- 46	24 [illegible]	+1 1/4	+5.2
O	T BAR INC	11- 19	13 1/2	- 5/2	-3.5
O	TALLY CORP.	4- 9	7 5/8	+ 5/8	+5.5
A	TEC INC	6- 11	50 7/8	+5 1/4	+52.9
N	TEKTRONIX INC	33- 45	42 3/8	-5 3/8	-3.1
N	TELEX	3- 7	5 3/8	0	0.0
O	TESDATA SYSTEMS CP	13- 20	57 5/4	+ 5/4	+1.4
O	WILTEK INC	1- 5	1	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1978 RANGE (1)	CLOSE JUL 26 1978	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMERICAN BUS PRODS	6- 9	9 1/4	+ 1/2	+5.7
O	BALTIMORE BUS FORMS	2- 5	5 5/2	- 5/4	[illegible]
A	BARRY WRIGHT	54- 28	25 5/8	+ 1/8	+0.4
O	CYBERMATICS INC	5- 5	5 5/8	0	0.0
O	DUPLEX PRODUCTS INC	58- 27	24 7/8	+ 5/8	+1.5
N	ENNIS BUS. FORMS	8- 57	15 7/8	+ 3/8	+2.7
N	3M COMPANY	43- 60	50 1/4	- 5/8	-5.0
O	MOORE CORP LTD	26- 34	33 1/4	0	0.0
N	NASHUA CORP	58- 31	27 3/4	+ 1/2	+1.8
O	STANDARD REGISTER	20- 26	22 1/4	+ 1/4	+1.5
A	TAB PRODUCTS CO	8- 13	11 1/4	+ 1/8	+5.5
N	UARCO	19- 27	25 5/8	- 3/8	-1.5
A	WABASH MAGNETICS	10- 55	14	+ 5/4	+0.4
N	WALLACE BUS FORMS	18- 28	27	- 3/8	-1.5

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Management Science America, Inc.
3445 Peachtree Road, N.E. Dept. D-1
Atlanta, Georgia 30326
(404) 262-2376

Chicago (312) 986-2450
Los Angeles (213) 822-9766
New York (201) 871-4700

International Agent:
MSA International, Inc.
Brussels, Belgium
Tel. (02) 673.99.63
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